U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-282 943

Data Storage and Retrieval System for Pilot Wastewater Treatment Research Users Manual

Cincinnati Univ, Ohio

Prepared for

Municipal Environmental Research Lab, Cincinnati, Ohio

Mar 78

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/2-78-036	2.
3. RECIPIENT'S ACCESSION NO. PB282943	
4. TITLE AND SUBTITLE: Users Manual: Data Storage and Retrieval System for Pilot Wastewater Treatment Research	5. REPORT DATE: March 1978 (Issuing Date)
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S): Gregory A. Fish, Stanley L. Forsythe	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Southwestern Ohio Regional Computer Center, University of Cincinnati, Cincinnati, Ohio 45220	10. PROGRAM ELEMENT NO. 1BC611, SOS#4, Task 02
	11. CONTRACT/GRANT NO. GS-05S-10030
12. SPONSORING AGENCY NAME AND ADDRESS: Municipal Environmental Research Laboratory--Cin.,OH, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268	13. TYPE OF REPORT AND PERIOD COVERED: Final, 4-75 to 9-76
	14. SPONSORING AGENCY CODE: EPA-600-14
15. SUPPLEMENTARY NOTES: Project Officer: John N. English, (513) 684-7613	

16. ABSTRACT

The computer system described in this document was designed as a data storage and retrieval system for the water reuse project at the Blue Plains Treatment Plant located in Washington, DC. The system was designed to be run on EPA's UNIVAC 1110 located at Research Triangle Park, North Carolina and thus would require modifications to be transferable to other computer systems.

The Municipal Environmental Research Laboratory, MERL, was responsible for the water reuse project which was undertaken for the purpose of evaluating Advanced Waste Treatment Systems which have the potential for reliably producing potable quality water from municipal wastewater.

The pilot study was intended to evaluate the effectiveness of various processes in removing specific pollutants from wastewater. The six processes being evaluated at Blue Plains were Lime Clarification, Nitrification, Denitrification, Carbon Absorption, Filtration, and Chlorination.

This "User's Manual" describes the programs and files of the system, the use of terminals while using the system, and what the user needs to do to operate the five functions of the system.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
*Computer Programs Mathematical Models *Waste Treatment Water Reclamation *Automatic Data Processing Pilot Plant	Advanced Wastewater Treatment	13B

18. DISTRIBUTION STATEMENT: Release to Public	19. SECURITY CLASS *(This Report)*: Unclassified	21. NO. OF PAGES: 108
	20. SECURITY CLASS *(This page)*: Unclassified	22. PRICE: A05-A01

EPA Form 2220-1 (9-73)

* U.S. GOVERNMENT PRINTING OFFICE: 1978— 260-880/36

PB 282 943

United States
Environmental Protection
Agency

Municipal Environmental
Research Laboratory
Cincinnati OH 45268

EPA-600/2-78-036
March 1978

Research and Development

EPA

Users Manual

Data Storage and Retrieval System for Pilot Wastewater Treatment Research

Environmental Protection Technology Series

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

RESEARCH REPORTING SERIES

Research reports of the Office of Research and Development, U.S. Environmental Protection Agency, have been grouped into nine series. These nine broad categories were established to facilitate further development and application of environmental technology. Elimination of traditional grouping was consciously planned to foster technology transfer and a maximum interface in related fields. The nine series are:

1. Environmental Health Effects Research
2. Environmental Protection Technology
3. Ecological Research
4. Environmental Monitoring
5. Socioeconomic Environmental Studies
6. Scientific and Technical Assessment Reports (STAR)
7. Interagency Energy-Environment Research and Development
8. "Special" Reports
9. Miscellaneous Reports

This report has been assigned to the ENVIRONMENTAL PROTECTION TECHNOLOGY series. This series describes research performed to develop and demonstrate instrumentation, equipment, and methodology to repair or prevent environmental degradation from point and non-point sources of pollution. This work provides the new or improved technology required for the control and treatment of pollution sources to meet environmental quality standards.

This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

EPA-600/2-78-036
March 1978

Users Manual

DATA STORAGE AND RETRIEVAL SYSTEM FOR PILOT WASTEWATER TREATMENT RESEARCH

by

Gregory A. Fish
and
Stanley L. Forsythe
SouthWestern Ohio Regional Computer Center
Cincinnati, Ohio 45220

Assignment No. EPA-76-45
Contract No. GS-05S-10030

Project Officer

John English
Wastewater Research Division
Municipal Environmental Research Laboratory
Cincinnati, Ohio 45268

MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

DISCLAIMER

This report has been reviewed by the Municipal Environmental Research Laboratory, U.S. Environmental Protection Agency, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

FOREWORD

The Environmental Protection Agency was created because of increasing public and governmental concern about the dangers of pollution to the health and welfare of the American people. Noxious air, foul water, and spoiled land are tragic testimony to the deterioration of our natural environment. The complexity of that environment and the interplay between its components require a concentrated and integrated attack on the problem.

Research and development is that necessary first step in problem solution and it involves defining the problem, measuring its impact, and searching for solutions. The Municipal Environmental Research Laboratory develops new and improved technology and systems for the prevention, treatment, and management of wastewater and solid and hazardous waste pollutant discharges from municipal and community sources, for the preservation and treatment of public drinking water supplies, and to minimize the adverse economic, social, health, and aesthetic effects of pollution. This publication is one of the products of that research, a most vital communications link between the researcher and the user community.

This report describes a data storage and retrieval computer system designed to handle the large amount of data generated by the pilot study at the Blue Plains Treatment Plant located in Washington, D.C. The study evaluates the effectiveness of various treatments used in Advanced Waste Treatment Systems which have the potential for producing potable quality water from municipal wastewater. This process would not only prevent discharge of pollutants into the environment but recycles much needed pure water.

Francis T. Mayo, Director
Municipal Environmental
Research Laboratory

The computer system described in this document was designed as a data storage and retrieval system for the water reuse project at the Blue Plains Treatment Plant located in Washington, D.C. The system was designed to be run on EPA's UNIVAC 1110 located at Research Triangle Park, North Carolina and thus would require modifications to be transferable to other computer systems.

The Municipal Environmental Research Laboratory, MERL, was responsible for the water reuse project which was undertaken for the purpose of evaluating Advanced Waste Treatment Systems which have the potential for reliably producing potable quality water from municipal wastewater.

The pilot study was intended to evaluate the effectiveness of various processes in removing specific pollutants from wastewater. The six processes being evaluated at Blue Plains were Lime Clarification, Nitrification, Denitrification, Carbon Absorption, Filtration, and Chlorination.

This "User's Manual" describes the programs and files of the system, the use of terminals while using the system, and what the user needs to do to operate the five functions of the system. These five functions are:

1. Program PREP to create the two tables of water systems information.
2. Program SYSTAT to list the computer system.
3. Program DATASTORE to store water sample data.
4. Program REPGEN to produce statistical reports based on the stored sample data.
5. Program PREPLT to produce plots of time vs. contaminant ("parameter") using program TYBLUE.

The system is designed to use a combination of batch and demand (on-line) interaction with the computer.

This report was submitted in fulfillment of Task Assignment No. EPA-76-45, Contract No. GS-05S-10030 by SouthWestern Ohio Regional Computer Center, University of Cincinnati under the sponsorship of the U.S. Environmental Protection Agency and was completed September, 1976.

CONTENTS

Subject	Page
Section One - Introduction	
A. History and Development of the Project	1
B. Project References	3
Section Two - System Overview	
A. System Application	4
B. System Operation	4
Section Three - Program and File Descriptions	
A. General Information.	8
B. BLUEPROG	9
1. Program PREP	9
2. Program SYSTAT	11
3. Program DATASTORE.	12
4. Program REPGEN	12
5. Program PREPLT.	13
6. Program TYBLUE	14
7. Subroutine READIT.	15
8. Subroutine WRITIT.	16
9. Subroutine DEMAND.	17
10. Subroutine VERDAT.	18
11. Subroutine CONDAT.	19
12. Subroutine DATCON.	19
13. Subroutine CLEAR	19
14. Subroutine PBUFF	20
15. Subroutine STATS	21
16. Subroutine TYPRE	22
17. Subroutine GPLTDS.	23
18. Subroutine GPLTBS.	24
C. ECL Files.	24
D. FILEA.	26
E. FILEB.	26
F. BPDATA	35
Section Four - Introduction to the UNIVAC 1110	
A. General Information.	36
B. The UNIVAC 1110.	37

CONTENTS (Continued)

C. Demand Terminal Session Initialization and Termination. 38
1. Anderson-Jacobson 830. 38
2. Anderson-Jacobson 630. 38
3. Texas Instrument Silent 700. 39
4. Tektronix 4012 39
5. Session Initialization 39
6. Session Termination. 40
D. Error Correction Procedures. 41

Section Five - Operating Instructions for the Blue Plains Data Storage and Retrieval System

A. General Instructions 42
B. Program PREP 43
1. Batch Processing 43
2. Demand Processing. 47
C. Program SYSTAT 58
1. Batch Processing 58
2. Demand Processing. 58
D. Program DATASTORE. 62
1. Batch Processing 62
2. Demand Processing. 62
E. Program REPGEN 73
1. Batch Processing 73
2. Demand Processing. 88
F. Program PREPLT 91
G. Error Messages 98

Section 1

Introduction

A. History and Development of the Project

1. Description of the Blue Plains Pilot Treatment Plant

The Municipal Environmental Research Laboratory, MERL had responsibility for a water reuse project at the Blue Plains Treatment Plant located in Washington, DC. The water reuse project was undertaken for the purpose of evaluating Advanced Waste Treatment (AWT) systems which hold the potential for reliably producing potable quality water from municipal wastewater.

Intensive long-term treatment characterization studies were conducted to achieve the following objectives:

a. Identification of specific pollutants in the system's final effluent and the performance of individual processes in removing these pollutants.

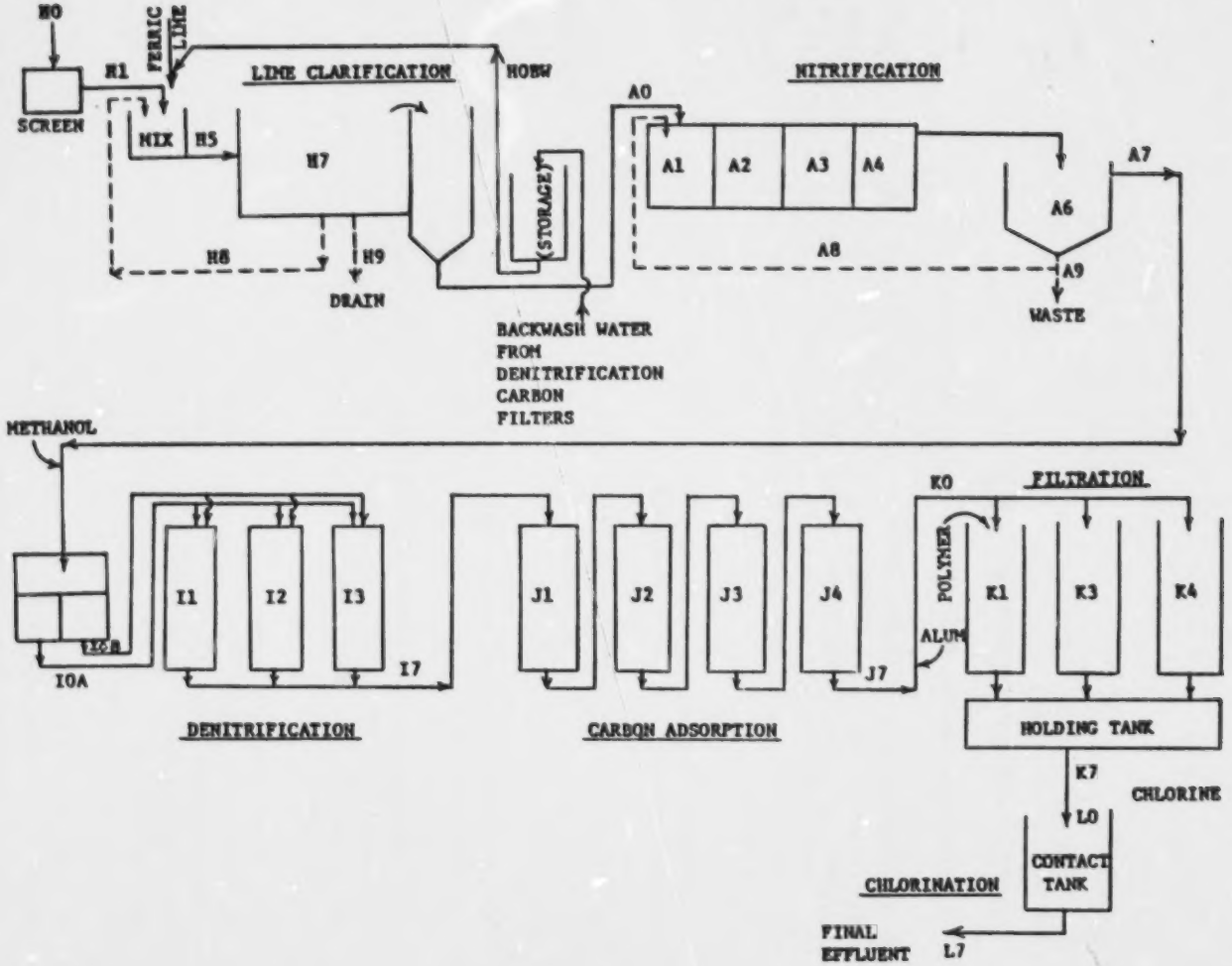
b. Provide data on process and system performance variability and reliability with respect to pollutant removal.

The AWT system configuration employed at the Blue Plains facility included six treatment processes. In order to facilitate the monitoring of the processes, each one was assigned a code. The processes and their codes are:

a.	Lime Clarification	Code H
b.	Nitrification	Code A
c.	Denitrification	Code I
d.	Carbon Adsorption	Code J
e.	Filtration	Code K
f.	Chlorination	Code L

A schematic flow diagram of the system is shown in figure I-1. Within each one of the above processes are test nodes from which the water quality samples were drawn (denoted by an integer associated with the process code). The water quality samples were taken by the operators at

FIGURE I-1 REUSE SYSTEM SCHEMATIC



varying frequencies from several times a day to once or twice a month, depending upon the type of sample (grab or composite). After taking the samples, they were analyzed for the presence or absence of various parameters, i.e. pH, alkalinity, temperature, trace metals, organics, etc. The system was operational twenty-four hours a day with operators assigned to three shifts of eight hours each.

2. Preview of the Blue Plains Storage and Retrieval System

Establishing the reliability of the previously described AWT system required a program of routine monitoring of the system performance. To this end a mass of valuable data was obtained. Clearly, an efficient data storage and retrieval system was needed to process the data and aid in establishing system performance and credibility.

The SouthWestern Ohio Regional Computer Center (SWORCC) designed and implemented such a system for the Blue Plains Pilot Treatment Plant. The storage and retrieval system utilized the inverted tree structure of the Pilot Plant (i.e. each process having a number of test nodes with the sample drawn from each node being analyzed for a number of parameters) as a basis for the design. The system design specifications were produced under Task Assignment No. EPA-76-28, Contract No. GS-05S-09678 with the implementation done under Task Assignment Nos. EPA-76-16 and EPA-76-45, Contract No. GS-05S-10030. The system has been implemented on the EPA UNIVAC 1110 located at Research Triangle Park, North Carolina.

B. Project References

Project Sponsor: Municipal Environmental Research Laboratory, ERC, EPA.

Operating Center: National Computing Center, Research Triangle Park, North Carolina

Feasibility Study and Systems Design Specs: "Final Analysis of Blue Plains Water Quality Data Storage and Retrieval System", prepared by Gregory A. Fish and Stanley L. Forsythe, SWORCC, under Task Assignment No. EPA-75-28, September, 1975.

Systems Maintenance Documentation: Included in this User's Manual.

Statements of Work: Task Assignment Nos. EPA-75-28, EPA-76-16 and EPA-76-45.

Section 2

System Overview

A. System Application

The Blue Plains Data Storage and Retrieval System is designed to allow Blue Plains personnel to store, edit and retrieve water quality data. Processing may take place in either batch or demand mode. Batch processing allows the user to submit a set of cards or card images to the computer for processing without the user being asked for additional information while processing is taking place. The user obtains all output after processing is complete. Demand processing allows the user to interact with the computer while processing is taking place, with any results of the processing being returned immediately to the user.

The system is modular in design. As the user needs more or different information, programs may be added or modified without destroying the integrity of the system. At present, the minimum configuration for a typical storage and retrieval system is supplied, so as not to overwhelm Blue Plains personnel with a lot of unnecessary options.

B. System Operation

As previously stated, the programs of the Blue Plains Data Storage and Retrieval System have been designed to operate in batch or demand mode. However, certain functions within a given program may be restricted to one mode or the other. The user is restricted to batch mode when the volume of data to be entered or the amount of output expected is large enough to involve a lengthy terminal session. The user is restricted to demand mode when it is felt that the queries from the system are necessary in order to correctly perform the desired function. In addition, demand mode allows the user a "quick-look" capability, i.e. direct output to the terminal instead of the delays inherent in batch processing. Mode restriction has been performed in the following manner. For each program, two sets of Executive Control Language (ECL) exists, one for batch and one for demand mode. The ECL for batch processing sets bit 12 of the Run Status Word (RSW); the ECL for demand processing does not reference the RSW, leaving bit 12 off. FORTRAN V programs access the RSW

by the SSWITCH routine. If bit 12 is on, indicating batch processing and the user attempts to use a function restricted to demand mode, an error occurs and processing terminates. A similar error will occur if the user attempts to use a function restricted to batch mode while utilizing demand processing. Instead of terminating in error, the user receives an error message and is prompted to enter a different function.

Before reviewing the actual system, a few definitions and standards should be explained. As previously mentioned, the Blue Plains plant is subdivided into several processes, each with several test nodes where samples may be drawn for analysis. For the Blue Plains Data Storage and Retrieval System, the processes are denoted Subsystems, each still associated with a single alphabetic code. Thus the H subsystem would be the one where lime clarification takes place. Each of the test nodes is denoted a Sampling Station, each associated with a single digit code. The two aforementioned codes together uniquely identify a particular test node (subsystem/sampling station). For example, H0, H1, H5, H7 all represent test nodes within the H subsystem for the current Blue Plains plant. Sampling frequencies are also given codes. A Grab sample (code G) is one which is taken at a particular time and is unique unto itself. The time at which the sample is taken is important, as well as the date. A Daily Composite sample (code D) is one where at several times during the day, samples are drawn, mixed up, and analyzed together. Thus the time of day the sample was taken is of no significance, only the date. A Weekly Composite sample (code W) is similar to the daily composite sample, but the individual samples are spread out over one week instead of a single day. This code is currently not used.

So far a sample may be identified as to where it came from and how it was taken. To identify what is in the sample, six character (maximum) mnemonic names have to be assigned to the particular parameters to be examined, i.e. FE for iron, TOC for total oxygen content, PO4 for phosphates, etc. Since a given sample may be assayed for several different parameters, these parameter codes are cross matched to the subsystem/sampling station codes. This cross matching defines the total plant configuration to the storage and retrieval system.

FigureII-1shows the flowchart of the Blue Plains Data Storage and Retrieval System. The user enters the initial system configuration into program PREP which builds the Master Directory (FILEA and FILEB). Then as the user begins to collect data from the plant, it is entered into the system via program DATASTORE and stored in the actual database

BLUE PLAINS PILOT TREATMENT PLANT
DATA STORAGE AND RETRIEVAL SYSTEMS

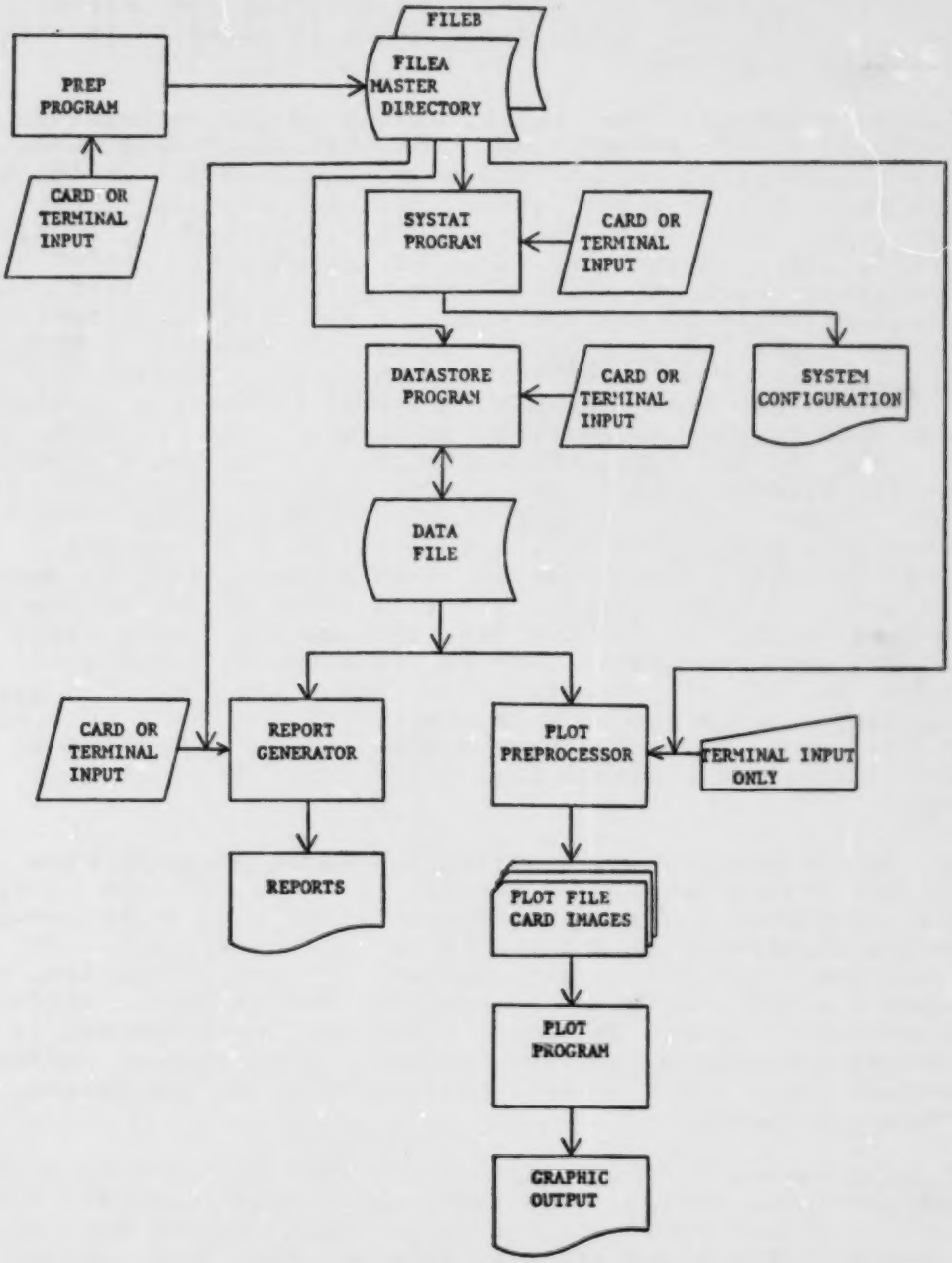


Figure II-1

(BPDATA). If the user then wishes reports of data already collected, program REPGEN is run, providing him with descriptive statistics and if desired, raw data listings. If plots of the data (time versus value) are desired, program PREPLOT is run, which selects the data, reformats it, adds control information and initials running of a modified version of program TYPLOT (originally developed as part of the NWTC Graphics Package) which actually produces the plots.

Although much checking of the data is done before it enters the database, errors invariably are found. The user may, at any time, edit the database, altering or removing erroneous data by specifying one of several editing functions of program DATASTORE. If the user decides to expand the system (i.e. add more subsystems, sampling stations or parameters) or alter some of the information in the Master Directory, he may do this at any time by using the editing function of program PREP. In addition, the user may display the current system configuration by running program SYSTAT.

Once the user has obtained all the reports and plots for a particular set of data, it may be archived to tape, the on-line files deleted, and the whole procedure may be restarted for a new set of data.

Section 3

Program and File Description

A. General Information

There are five permanent and three semi-permanent on-line files in the Blue Plains Data Storage and Retrieval System. The permanent files contain the programs and ECL necessary to operate the system; the semi-permanent files are the actual data files of the system which will usually be archived to tape when they are no longer needed. The files and their contents are as follows:

BLUEPROG	Program File containing all of the programs for the system.
DATASTORE	File containing ECL for batch execution of program DATASTORE.
PREP	File containing ECL for batch execution of program PREP.
REPGEN	File containing ECL for batch execution of program REPGEN.
SYSTAT	File containing ECL for batch execution of program SYSTAT.
FILEA	Part of the Master Directory arranged by subsystem, sampling station, parameter.
FILEB	Part of the Master Directory arranged by parameter, subsystem sampling station.
BPDATA	File where water quality data is stored.

All files of the system have the leftmost qualifier BLUEPL, and are registered to account 64030001 on the NCC UNIVAC 1110. The five permanent files of the system were backed up on tape 101334 utilizing the following ECL statements:

```
@ASG,T/W BACKUP.,16N,101334
@COPY,MG BLUEPROG.,BACKUP.
@COPY,MG DATASTORE.,BACKUP.
```

```
@COPY,NG PREP.,BACKUP.
@COPY,NG REPGEN.,BACKUP
@COPY,NG SYSTAT.,BACKUP.
```

B. BLUEPROG

This file is a UNIVAC program file which contains the programs of the Blue Plains Data Storage and Retrieval System. During system development it contained source, relocatable (product of compile) and absolute (product of collection) elements. For implementation, only the absolute elements, ready to execute, remain. Each of the main programs and subprograms is contained in an element of the same name, i.e. program PREP is in element PREP of file BLUEPROG and is denoted BLUEPROG.PREP. (There are two exceptions to this convention: REPGEN1 and STATS1 are versions of REPGEN and STATS which produce only normal statistics. They are present in source form only). A listing of the Table of Contents (TOC) of BLUEPROG before implementation may be seen in figure III-1. This TOC reflects the status of the file on the system backup tape.

The remainder of this subsection will be structured as follows. Each of the program units (main programs, subprograms) will be briefly described. Detailed descriptions of input, output and other information needed to execute a particular program may be found in Section Five (Operating Instructions for the Blue Plains Data Storage and Retrieval System) of this manual.

1. Program PREP

Program Functions

a. To build the Master Directory (FILEA, FILEB)
b. To edit the Master Directory, enabling the user to change and/or expand the system at any time.

Input Files

a. Card or Terminal Input
b. FILEA - only input for edit function
c. FILEB - only input for edit function.

Output Files

a. FILEA
b. FILEB

Subprograms Used

a. READIT

```
BLUEPL*BLUEPROG
ASM   CLEAR(0)
REL   CLEAR
FOR   CONDAT(0)
REL   CONDAT
FOR   VERDAT(0)
REL   VERDAT
FOR   DATCON(0)
REL   DATCON
FOR   PBUFF(0)
REL   PBUFF
FOR   DATASTORE(0)
REL   DATASTORE
ABS   DATASTORE
FOR   READIT(0)
REL   READIT
FOR   WRITIT(0)
REL   WRITIT
FOR   PREP(0)
REL   PREP
FOR   REPGEN1(0)
REL   REPGEN1
FOR   STATS1(0)
REL   STATS1
REL   STATS
REL   REPGEN
ABS   REPGEN
FOR   TYPRE(0)
REL   TYPRE
ELT   TYBLUE(0)
REL   TYBLUE
ABS   TYBLUE
FOR   REPGEN(0)
FOR   STATS(0)
ABS   REPGEN1
REL   DEMAND
ABS   PREP
ABS   SYSTAT
FOR   SYSTAT(0)
REL   SYSTAT
FOR   DEMAND(0)
FOR   PREPLT(0)
REL   PREPLT
ABS   PREPLT
ELT   GPLTDS(0)
REL   GPLTDS
ELT   GPLTBS(0)
REL   GPLTBS
ABS   PRBLUE
>
```

Figure III-1

b. WRITIT
c. DEMAND
d. VERDAT
e. CONDAT

Additional Remarks

Because of the large number of parameters, latency information and data values necessary to create the master directory, the initial execution of PHIP has been limited to batch mode. This will eliminate a long, tedious terminal session and also allow user verification of the input data.

The edit capability of the program allows additions and/or changes to the system configuration as a result of either keypunch errors on initial generation or future developments and modifications to system configuration. The edit capability may only be utilized in demand mode.

2. Program SYSTAT

Program Function

a. Display the current system configuration, listing subsystem, sampling station and parameters being utilized.

Input Files

a. Card or Terminal Input
b. FILEA
c. FILEB

Output Files

None

Subprograms Used

a. READIT

Additional Remarks

Because of the large amounts of printing involved in displaying the entire system configuration, this option has been limited to batch mode. However, if only a particular subsystem, sampling station or parameter is desired, the program may be executed in demand mode.

3. Program DATASTORE

Program Functions

a. To store new data in the main data file (BPDATA).
b. To edit data already existing in BPDATA.
c. To dynamically expand BPDATA, if necessary.

Input Files

a. Card or Terminal Input
b. FILEA
c. FILEB
d. BPDATA

Output Files

a. BPDATA
b. FILEB - current number of records and current maximum number of records on BPDATA, first time parameter indicator all may be updated.

Subprograms Used

a. VERDAT
b. CONDAT
c. DATCON
d. CLEAR

Additional Remarks

The two main functions of this program are data storage and data edit. The storage function of the program may be run in either batch or demand mode. Since prompting messages were deemed necessary to aid the user, the edit functions may only be run in demand mode.

4. Program REPGEN

Program Function

a. To produce reports, including data listings and statistical summaries of the data stored in BPDATA.

Input Files

a. Card or Terminal Input
b. FILEA
c. FILEB
d. BPDATA

Output Files

None

Subprograms Used

a. VERDAT
b. CONDAT
c. DATCON
d. PBUFF
e. STATS

Additional Remarks

Two basic types of reports are produced by this program, one arranged by subsystem, the other by parameter. Both types may be obtained either with or without raw data listings. Summary reports, where the user gets all subsystems or all parameters within a specified time period, are limited to batch mode due to the volume of print expected.

The current report contains both normal and lognormal statistics. A previous version (REPGEN1) contained only normal statistics, as specified in the design specifications for this system. A listing of REPGEN1 is included along with REPGEN but REPGEN1 has not been included in the active programs of the Blue Plains system.

5. Program PBEPLT

Program Function

a. Allows user to interactively enter requests for plots of time versus value.
b. Extracts data to be plotted from BPDATA.
c. Reformats data and writes a data file in a form compatable with program TYBLUE.
d. Builds control file for TYBLUE.
e. Starts execution of TYBLUE.

Input Files

a. FILEB
b. BPDATA

Output Files

a. TYCTRL
b. TYDATA

Subprograms Used

a. VERDAT
b. CONDAT
c. DATCON

Additional Remarks

This program may be run only in demand mode as it prompts the user for information needed such as data, parameters, sampling stations and plot options. It then extracts the data, builds the output files and either:

a. Submits program TYBLUE (@START) for batch execution,
b. Begins execution of program TYBLUE (@ALD) in demand mode

depending on which option the user selected.

6. Program TYBLUE

Program Function

a. Produces plots of time versus parameter value for the water quality data stored in BPDATA.

Input Files

a. TYCTRL
b. TYDATA

Output Files

None

Subprograms Used

a. CALCOMP Basic Routines
b. * - see additional comments

Additional Comments

This program is a modified version of program TYPLOT, part of the graphics system developed for the National Waste Treatment Center (NWTC) of EPA. All needed subprograms are part of the TYBLUE element and will not be discussed separately. For a further description, see the Functional Documentation for the

NWTC Graphics System, provided in response to Task EPA-76-01, Contract No. GS-05S-10030.

7. Subroutine READIT

Function

a. This subroutine is used to read into core the Master File Directory consisting of FILEA and FILEB data.

FORTRAN USAGE

CALL READIT

There are no arguments for this subroutine; all information is passed in labeled common blocks.

Additional Comments

The information read by this subroutine is passed to the main program via labeled common blocks. They are described as follows.

Common Block FILEA: contains the information obtained from the FILEA segment of the Master File Directory.

SPECSA - an array containing alphanumeric information to be used for labeling and titles in the reports.

NUMSUB - A variable containing the total number of sampling stations in the system.

ITOTAL - A variable containing the total number of sampling stations in the system.

NUMSAM - An array containing the number of sampling stations at a specific subsystem.

NSTA - An array containing the number assigned to a specific subsystem/sampling station pair.

NUMPAR - An array containing the number of parameters measured at the various sampling stations.

NDATE - A variable containing the beginning date of system operation.

SUBCOD - An array containing the codes for the various subsystems.

Common Block FILEB: Contains the information obtained from the FILEB segment of the Master File Directory.

SPECSB - An array containing alphanumeric information to be used for labels and titles in the reports.

NPM - A variable containing the total number of parameters measured in the system.

PNAME - An array containing the names of the parameters.

IRP - An array containing the initial record pointer for each parameter.

NUMSTA - An array containing the number of sampling stations at which a parameter is measured.

NOREC - A variable containing the number of records currently on file.

MAXREC - A variable containing the number of tracks to be used when allocating more space to the database.

Common Block FILEC: Contains an array used in data verification.

ALOC - An array which contains the subsystem code and sampling station number read in FILEA data. This is compared to the information read for FILEB and if the two files do not correspond an appropriate error message is written.

8. Subroutine WRITIT

Function

a. This subroutine is used to write modified Master File Directory information onto mass storage.

b. Modifications may be in the form of additions and corrections to titles and labels.

FORTRAN Usage

```
CALL WRITIT(IADD,PSPECS,IONT)
```

where IADD - A variable denoting the type of addition to be performed.

If IADD = 0 - no additions
1 - add a subsystem
2 - add a sampling station
3 - add an existing parameter to a sampling station
4 - add to a new parameter

PSPEC- An array containing the update information for FILEB.

SPECS- An array containing locating information to determine proper position in FILEA and FILEB to insert the update data.

INCT - A variable which contains the number of parameters to add.

Additional Comments

This subroutine also uses the same labeled common blocks described under Subroutine READIT.

9. Subroutine DEMAND

Function

a. This subroutine is actually the demand segment of program PREP. It allows the user to make additions or corrections to the Master File Directory.

b. The user is prompted for all information necessary to make the modifications requested. There are no arguments for this subroutine, all information is passed in labeled common blocks.

FORTRAN Usage

CALL DEMAND

Additional Comments

This subroutine also uses the same labeled common blocks described under Subroutine READIT.

The user is allowed the choice of,
1. making additions to the Master File Directory or
2. changing titles and headings.

Under the Addition segment the user may add
1. a subsystem,
2. a sampling station,
3. an existing parameter to a sampling station or
4. a new parameter.

Under the change segment the user may change
1. the system title,
2. the subsystem titles,
3. the sampling station titles, or
4. the parameter names.

Whenever the user is prompted to enter a function code, he may obtain a list of valid codes by entering an "H" for HELP.

10. Subroutine VERDAT

Function

a. Checks date or date/time entered by user for accuracy.

FORTRAN Usage

```
CALL VERDAT (IDATE,ICODE,IFLAG)
```

where IDATE is a 3 word integer array date (MM DD YY) or 4 word date/time array (MM DD YY HHMM) to be checked.

ICODE = 1 for 3 word date array
2 for 4 word date/time array

IFLAG returned from routine
0 - date or date/time OK
1 - invalid date or date/time

Additional Comments

The routine checks for valid months (1-12), the correct number of days in each month (i.e. 31 is an invalid day in September, February 29 invalid for non-leap year), and a year between 1975 and 1999. Failure to call this routine before calling CONDAT could yield erroneous results from CONDAT.

11. Subroutine CONDAT

Function

a. Converts calendar date to Julian date.

FORTRAN Usage

CALL CONDAT (IDATE, JDATE)

where IDATE is a 3 word integer calendar date in the form MM DD YY passed to the routine.

JDATE is returned to Main and is the single word Julian equivalent of IDATE, on the form YYDDD, i.e. 01/30/76 = 76030

Additional Comments

The data input to the routine should first be checked by subroutine VERDAT for accuracy. Incorrect dates input will yield erroneous results.

12. Subroutine DATCON

Function

a. Converts Julian date to calendar date.

FORTRAN Usage

CALL DATCON (IDATE, JDATE)

where IDATE is a 3 word integer calendar date of the form MM DD YY returned to main.

JDATE is the single word integer Julian date passed to the routine in the form YYDDD.

Additional Comments

The Julian date passed to DATCON should be one computed by CONDAT. If an erroneous Julian date is passed to DATCON an error message is printed and program control is returned to main.

13. Subroutine CLEAR

Function

a. Clears out (zeros) FORTRAN I/O unit number so that it may be used for a different file.

FORTRAN Usage

CALL CLEAR (NUNIT)

where NUNIT is the single word integer unit number to be cleared.

Additional Comments

This routine is written in UNIVAC 1100 Assembler to link with a FORTRAN V main program. It stores zeros in the specified location of table NTAB$ the FORTRAN I/O unit number table. It is normally used after a call to CLOSE which drains and releases the buffers. It should not be used for the following I/O units:

0 - reread unit
1 - PUNCH$ (primary output punch file)
5 - READ$ (primary input file card)
6 - PRINT$ (primary output file - printer)
30 - reread

14. Subroutine PBUFF

Function

a. Stores raw data extracted from BPDATA by program REPGEN.
b. Produces the raw data listings of program REPGEN.

FORTRAN Usage

CALL PBUFF(PARM,KDATE,SS,FREQ,VALUE)

where PARM is the 6 character Parameter I.D.

KDATE is single word integer Julian date/time in the form YYDDDHHMM.

SS is the two character subsystem/sampling station code.

FREQ is the single character frequency code.

VALUE is the floating point data value.

Additional Comments

PBUFF is used only when reports with raw data listings are requested. Each call passes one complete data point, which is then stored in a buffer area. After

150 points are stored in this manner, the buffer area is dumped to the primary output file and is reinitialized. A call to PBUFF with PARM equal to a full word of blanks indicates the last call, and any remaining points in the buffer are dumped out.

15. Subroutine STATS

Function

a. Calculates normal and lognormal statistics for printing on the reports.

FORTRAN Usage

CALL STATS (N,SUM,SUMSQ,ALSUM,ALSSQ,AMEAN,,STD,GMEAN,S)

where N is the sample size

SUM is the sum of the sample (Y)

SUMSQ is the sum of squares of the sample (Y)

ALSUM is the sum of common logs of sample (logY)

ALSSQ is the sum of squares of common logs of sample ((logY))

AMEAN is the arithmetic mean

STD is the standard deviation

GMEAN is the geometric mean.

S is the spread factor.

Additional Comments

The following computational formulae were used in computing the normal and lognormal statistics.

AMEAN = SUM/N

$$STD = SQRT\left(\frac{SUMSQ - \left(\frac{SUM}{N}\right)}{N-1}\right)$$

X = ALSUM/N
GMEAN = 10

$$Y = SQRT\left(\frac{ALSSQ - \left(\frac{ALSUM}{N}\right)}{N-1}\right)$$

S = 10

For zero values the normal sums and sample sizes are incremented but not the log sums because the log of 0 is undefined.

The original version of STATS which calculates normal statistics only, is included in source form only as element STATS1.

16. Subroutine TYPRE

Function

a. This subroutine is used to write the control information used by the plot program TYBLUE into a control file.

FORTRAN USAGE

CALL TYPRE

There are no arguments for this subroutine. All information is passed in the labeled common block.

Additional Comments

The information needed by this program to write the plot control file is passed via the labeled common block described as follows:

Common Block PASS

AKEY - contains the information describing line type to be used when plotting.

SYM - contains the information describing which symbol is to be used when plotting.

TITLE - an array containing the titling information for the plot.

NTMIN - an array containing the earliest date/time and day of the week code for the requested time period.

NTMAX - an array containing the latest date/time for the requested time period (no day of the week code).

XLEN - a variable containing the length of the x-axis, in inches.

YMIN - an array containing the minimum data value.

YMAX - an array containing the maximum data value.

LOGSW - A variable which is used to determine if the plot is to have log or linear scaling on the y-axis. 0=linear, 1=log.

IGRID - an array containing the flags turning on or off the various options requested by the user. These options are described in the segment for the plot program TYBLUE.

INUM - a variable containing the total number of lines to be drawn on the plot. Up to 5 lines may be drawn.

17. Subroutine GPLTDS

Function

This subroutine is used to submit the plot job for demand execution. This will allow the job to be processed while the user is still logged on to the demand terminal.

FORTRAN Usage

CALL GPLTDS (CNTL,DATA)

where CNTL - is the file name containing the plot control information.

DATA - is the file name containing the data points to be plotted.

Additional Comments

This program writes the UNIVAC ECL statements necessary for program execution into a file called PLOTRUN. This file is then added to the demand terminal runstream thus allowing demand execution of the plot job. The output, both printed and punched, is then sent to the DATA GENERAL (site I.D. DATAOQ) located in room 308, EPA building.

18. Subroutine GPLTBS

Function

This subroutine is used to submit the plot jcl for batch execution. This means that the job will be submitted into the batch job query for execution at a later time.

FORTRAN Usage

CALL GPLTBS(CNTL,DATA)

where CNTL - is the file name containing the plot control information.

DATA - is the file name containing the data points to be plotted.

Additional Comments

This program writes the Univac ECL statements necessary to start a jobstream into a file and then, via a call to ERTRAN (Executive Request Subroutine) the plot job is started as a batch job. The output, both printed and punched, is sent to the DATA GENERAL (site I.D. DATA/Q) located in room 308, EPA building upon job termination.

C. ECL Files

The four remaining permanent files of the Blue Plains Data Storage and Retrieval System are UNIVAC SDF files containing Executive Control Language (ECL) for running programs in batch mode. These files were supplied so the user need only remember two ECL statements - @XQT and @ADD. In demand mode the user would enter @XQT pgm. In batch he would build a runstream with an @RUN, @ADD pgm., the input data and @FIN. The @ADD file would contain the ECL necessary for proper batch program execution.

Each of the ECL filenames corresponds to the name of the program it invokes, i.e. file PREP contains the ECL necessary for the proper batch execution of program PREP.

Following are listings of the four ECL files (Figure III-2). Note each file routes output (@SYM), sets page depth (@HDO), sets the batch switch (@SETC) and invokes execution (@XQT). If necessary, these files may be changed using the ED processor.

ECL Files

PREP.

```
@SYM PRINT$.,,DATAOX
@HDG X.M,64,0,4
@SETC 1
@XQT BLUEPROG.PREP
```

DATASTORE.

```
@SYM PRINT$.,,DATAOX
@HDG X.M,64,0,4
@SETC  1

@XQT BLUEPROG.DATASTORE
```

REPGEN.

```
@SYM PRINT$.,,DATAOX
@HDG X.M,64,0,2
@SETC  1
@XQT BLUEPROG.REPGEN
```

SYSTAT.

```
@SYM PRINT$.,,DATAOX
@HDG X.M,64,0,4
@SETC  1
@XQT BLUEPROG.SYSTAT
```

D. FILEA

This file is a UNIVAC SDF file and is the part of the master directory containing the subsystem - sampling station - parameter relationships. It was created by program PREP, utilizing sequential formatted processing. The file consists of four different types of records. Following is a description of each record along with FORMAT specifications.

1. System Title, Number of subsystems (N), Beginning Date in Julian Mode, Total Number of Sampling Stations
(10A6,I2,1X,I5,1X,I2)

2. Subsystem Code, Subsystem Title, Number of Sampling Stations for this Subsystem (M).
(A1,1X,6A6,1X,I2)

3. Sampling Station Code, Sampling Station Title, Sampling Station Number, Number of Parameters Measured here (MX).
(A1,1X,6A6,1X,2I3)

4. Parameter Number and Sample Frequency packed into single word, repeated up to 14 times per record.
(14A4) - each A4 later decoded to I3,A1.

For this file there is only one type 1 record. Type 2 is repeated N times, each followed by M of type 3. Each type 3 is followed by at least one type 4 record depending upon how many parameters are being sampled at that particular sampling station. Thus the file is arranged hierarchically, similar to the Blue Plains Plant Layout. Following is a listing (Figure III-3) of an actual FILEA utilized in implementing the system. Note the composition of this file is variable as information may be added or changed by program PREP.

E. FILEB

This file is a UNIVAC SDF file and is the part of the master directory containing the parameter - subsystem sampling station relationships. It was also created by program PREP utilizing sequential formatted processing. The file consists of three different types of records. Following is a description of each record along with FORMAT specifications.

1. Current Number of Parameters (N), Current Number of Records in BPDATA, Current Maximum Number of Records in BPDATA.
(3I5)

```
FILEA.
1.          EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM
2.       H           LIME CLARIFICATION                7
3.       0             RAW WASTEWATER                   1  2
4.         1G  3G
5.       1          SCREENED RAW WASTEWATER             2 35
6.         4G  6G 28D 29D 30D 31D 32D 33D 34D 35D 36D 39D 40D 41D
7.        42D 48G 49G 50G 51G 52G 53G 54G 55G 56G 57G 58G 59G 96G
8.       101G 99G 60G103G 61G 62G102G
9.       2  COLUMN AND FILTER BACKWASH RECYCLE        3  2
10.        1G  7G
11.      5             FLOCCULATION TANK              4  8
12.        4G 35D 37D  9G 10G 11G 12G  8G
13.      7          LIME CLARIFIED EFFLUENT           5 27
14.        5G  6G 28D 29D 30D 31D 32D 33D 34D 35D 36D 39D 40D 41D
15.       42D 48G 49G 50G 51G 52G 53G 54G 55G 56G 57G 58G 59G
16.      8             LIME SLUDGE RECYCLE            6  1
17.        1G
18.      9             LIME SLUDGE WASTED             7  5
19.        2G 35D 37D 38D 13G
20.      A               NITRIFICATION                9
21.      0             NITRIFICATION FEED               8  2
22.        4G  3G
23.      1               REATOR PASS ONE                9  1
24.       14G
25.      2              REACTOR PASS TWO               10  6
26.        4G  6G 15G 14G 35D 36D
27.      3              REACTOR PASS THREE             11  1
28.       14G
29.      4              REACTOR PASS FOUR              12  6
30.        4G  6G 15G 14G 35D 36D
31.      6                 CLARIFIER BED               13  1
32.       16G
33.      7          NITRIFICATION EFFLUENT            14 13
34.        1G  4G  6G 14G 28D 29D 30D 31D 32D 33D 34D 35D 36D
35.      8          NITRIFICATION RECYCLE             15  4
36.        1G 15G 35D 36D
37.      9           NITRIFICATION WASTE              16  2
38.        2G 13G
39.      I             DENITRIFICATION                10
40.      0           DENITRIFICATION FEED             17  4
41.       17G 18G 19G 43D
42.      1                 COLUMN ONE                 18  1
43.       20G
44.      2                 COLUMN TWO                 19  1
45.       20G
46.      3                COLUMN THREE                20  1
47.       20G
48.      4             COLUMN ONE EFFLUENT            21  1
49.       14G
50.      5             COLUMN TWO EFFLUENT            22  1
51.       14G
```

Figure III-3

```
52.       6         COLUMN THREE EFFLUENT              23  1
53.        14G
54.       7        DENITRIFICATION EFFLUENT            24 33
55.        28D  29D  30D  31D  32D  33D  34D  35D  36D  64G  60G  65G  66G  67G
56.        68G  69G  70G  71G  72G  73G  74G  75G  76G  77G  78G  79G  80G  81G
57.        82G  83G101G102G  63G
58.       8              SPLITTER BOX A               25  1
59.        14G
60.       9              SPLITTER BOX B               26  2
61.        14G  13G
62.       J            CARBON ADSORPTION              4
63.       1            LEAD CARBON COLUMN             27  3
64.        20G  30D  34D
65.       2           SECONDARY CARBON COLUMN         28  3
66.        20G  30D  34D
67.       3           TERTIARY CARBON COLUMN          29  3
68.        20G  30D  34D
69.       7           CARBON COLUMN EFFLUENT          30 16
70.        20G  22G  14G  28D  29D  30D  31D  32D  33D  34D  35D  64G101G102G
71.        13G  63G
72.       K                 FILTRATION                5
73.       0                FILTER FEED                31  3
74.        23G  24G  25G
75.       1                 FILTER ONE                32  1
76.        21G
77.       3                FILTER THREE               33  1
78.        21G
79.       4                FILTER FOUR                34  1
80.        21G
81.       7             FILTRATION EFFLUENT           35 15
82.         4G  22G  28D  29D  30D  31D  32D  33D  34D  35D105D  84G  85G  96G
83.        13G
84.       L                DISINFECTION               2
85.       0             DISINFECTION FEED             36  1
86.        26G
87.       7           DISINFECTION EFFLUENT           37 79
88.         4G   6G   3G  14G  22G  27G  28D  29D  30D  31D  32D  33D  34D  35D
89.        37D  39D  44D  45D  40D  42D  41D  46D  47D104G103G  64G  86G  87G
90.        60G  88G  89G  90G  91G  92G  93G  94G  61G  95G  62G  48G  49G  50G
91.        51G  52G  53G  54G  55G  56G  57G  58G  59G  65G  66G  67G  68G  69G
92.        70G  71G  72G  73G  74G  75G  76G  77G  78G  79G  80G  81G  82G  83G
93.       100G  96G101G  99G  97G  98G102G  13G  63G
94.       M                ION EXCHANGE               2
95.       0             ION EXCHANGE FEED             38  1
96.         1G
97.       7             ION EXCHANGE EFFLUENT         39 21
98.         4G   6G   3G  27G  28D  29D  30D  31D  32D  33D  34D  35D  39D  44D
99.        45D  40D  42D  46D  47D102G  13G
```

FILEB.

```
105  703  800
FLOW 1          GPM      1  6
G  1    .00000000        50.000000   G  3    .00000000    10.000000   G  6    .00000000    10.000000
G 14    .00000000        50.000000   G 15    .00000000    15.000000   G 38    .00000000     6.0000000
FLOW 2          GAL      2  2
G  7    .00000000        300.00000   G 16    .00000000    26.000000
  TEMP   DEGREES C       3  4
G  1    13.000000        28.000000   G  8    13.000000    28.000000   G 37    13.000000    28.000000
G 39    13.000000        28.000000
    PH        UNITS      4  9
G  2    6.0000000        8.0000000   G  4    9.0000000    11.000000   G  8    9.0000000    11.000000
G 10    6.0000000        8.0000000   G 12    6.0000000    8.0000000   G 14    6.0000000    8.0000000
G 35    6.0000000        8.0000000   G 37    6.0000000    8.0000000   G 39    .00000000    8.0000000
 ALK P          PPM      5  1
G  5    20.000000        120.00000
ALK MO          PPM      6  7
G  2    70.000000        150.00000   G  5    100.00000    200.00000   G 10    40.000000    150.00000
G 12    40.000000        150.00000   G 14    40.000000    150.00000   G 37    40.000000    140.00000
G 39    .00000000        30.000000
KW HRS          KWH      7  1
G  3    .00000000        24.000000
FE FED        ML/MIN     8  1
G  4    100.00000        350.00000
  LIME          LBS      9  1
G  4    .00000000        1
FE ADD          GAL      10 1
G  4    .00000000        20.000000
FE CNC      LBS/GAL      11 1
G  4    2.0000000        5.0000000
FE DLN          GAL      12 1
G  4    .00000000        200.00000
DN TME          HRS      13 7
G  7    .00000000        24.000000   G 16    .00000000    24.000000   G 26    .00000000    24.000000
G 30    .00000000        24.000000   G 35    .00000000    24.000000   G 37    .00000000    24.000000
G 39    .00000000        24.000000
    DO          PPM      14 12
G  9    1.0000000        7.0000000   G 10    1.0000000    7.0000000   G 11    1.0000000    7.0000000
G 12    1.0000000        7.0000000   G 14    1.0000000    7.0000000   G 21    .00000000    3.0000000
G 22    .00000000        3.0000000   G 23    .00000000    3.0000000   G 25    3.0000000    9.0000000
G 26    3.0000000        9.0000000   G 30    .00000000    2.0000000   G 37    .00000000    4.0000000
    SV          ML/L     15 3
G 10    50.000000        1000.0000   G 12    50.000000    1000.0000   G 15    700.00000    1000.0000
BED LV          FT       16 1
G 13    2.0000000        12.000000
M FEED        ML/MIN     17 1
```

Figure III-4

46.	G 17	.00000000		300.00000							
47.	M ADD	L	18	1							
48.	G 17	.00000000		12.000000							
49.	M DILN	GAL	19	1							
50.	G 17	.00000000		95.000000							
51.	DP 1	PSIG	20	7							
52.	G 18	.00000000		25.000000	G 19	.00000000	25.000000	G 20	.00000000	25.000000	
53.	G 27	.00000000		35.000000	G 28	.00000000	35.000000	G 29	.00000000	35.000000	
54.	G 30	.00000000		35.000000							
55.	DP 2	IN H2O	21	3							
56.	G 32	.00000000		125.00000	G 33	.00000000	125.00000	G 34	.00000000	125.00000	
57.	TURB	FTU	22	3							
58.	G 30	.00000000		3.0000000	G 35	.00000000	3.0000000	G 37	.00000000	3.0000000	
59.	A FEED	ML/MIN	23	1							
60.	G 31	.00000000		300.00000							
61.	AL ADD	LBS	24	1							
62.	G 31	.00000000		3.0000000							
63											
.	A DILN	GAL	25	1							
64.	G 31	.00000000		100.00000							
65.	CL2 FD	LBS/DAY	26	1							
66.	G 36	.00000000		4.0000000							
67.	COND	MHOS	27	2							
68.	G 37	100.00000		600.00000	G 39	.00000000	600.00000				
69.	TOC	PPM	28	8							
70.	D 2	50.000000		150.00000	D 5	10.000000	50.000000	D 14	.00000000	15.000000	
71.	D 24	.00000000		20.000000	D 30	.00000000	15.000000	D 35	.00000000	15.000000	
72.	D 37	.00000000		15.000000	D 39	.00000000	10.000000				
73.	BOD	PPM	29	8							
74.	D 2	50.000000		200.00000	D 5	25.000000	75.000000	D 14	.00000000	10.000000	
75.	D 24	.00000000		15.000000	D 30	.00000000	15.000000	D 35	.00000000	15.000000	
76.	D 37	.00000000		15.000000	D 39	.00000000	10.000000				
77.	COD	PPM	30	11							
78.	D 2	150.00000		350.00000	D 5	50.000000	150.00000	D 14	.00000000	40.000000	
79.	D 24	.00000000		40.000000	D 27	.00000000	30.000000	D 28	.00000000	25.000000	
80.	D 29	.00000000		20.000000	D 30	.00000000	20.000000	D 35	.00000000	20.000000	
81.	D 37	.00000000		15.000000	D 39	.00000000	15.000000				
82.	TPO4	PPM	31	8							
83.	D 2	5.0000000		25.000000	D 5	.00000000	3.0000000	D 14	.00000000	2.0000000	
84.	D 24	.00000000		1.5000000	D 30	.00000000	1.5000000	D 35	.00000000	1.5000000	
85.	D 37	.00000000		1.5000000	D 39	.00000000	1.5000000				
86.	TKN	PPM	32	8							
87.	D 2	10.000000		30.000000	D 5	5.0000000	20.000000	D 14	.00000000	4.0000000	
88.	D 24	.00000000		4.0000000	D 30	.00000000	4.0000000	D 35	.00000000	4.0000000	
89.	D 37	.00000000		4.0000000	D 39	.00000000	4.0000000				
90.	NH3	PPM	33	8							

```
91.    D  2    5.0000000        25.000000   D  5   5.0000000    20.000000   D 14   .00000000    2.0000000
92.    D 24    .00000000        2.0000000   D 30   .00000000    2.0000000   D 35   .00000000    2.0000000
93.    D 37    .00000000        2.0000000   D 39   .00000000    1.5000000
94.      NO2NO3          PPM   34 11
95.    D  2    .00000000        .50000000   D  5   .00000000    .50000000   D 14   5.0000000    15.000000
96.    D 24    .00000000        10.000000   D 27   .00000000    10.000000   D 28   .00000000    10.000000
97.    D 29    .00000000        10.000000   D 30   .00000000    10.000000   D 35   .00000000    10.000000
98.    D 37    .00000000        10.000000   D 39   .00000000    10.000000
99.         SS         PPM   35 13
100.   D  2    50.000000        200.00000   D  4   1200.0000    3500.0000   D  5   5.0000000    100.00000
101.   D  7    10000.000        25000.000   D 10   1500.0000    3500.0000   D 12   1500.0000    3500.0000
102.   D 14    .00000000        20.000000   D 15   5000.0000    25000.000   D 24   .00000000    15.000000
103.   D 30    .00000000        5.0000000   D 35   .00000000    5.0000000   D 37   .00000000    5.0000000
104.   D 39    .00000000        5.0000000
105.        VSS         PPM   36  7
106.   D  2    25.000000        150.00000   D  5   5.0000000    40.000000   D 10   1000.0000    3000.0000
107.   D 12    1000.0000        3000.0000   D 14   .00000000    15.000000   D 15   3000.0000    19000.000
108.   D 24    .00000000        10.000000
109.        TS         PPM   37  3
110.   D  4    1500.0000        3500.0000   D  7   10000.000    25000.000   D 37   200.00000    500.00000
111.        TVS         PPM   38  1
112.   D  7    3000.0000        8000.0000
113.        TDS         PPM   39  4
114.   D  2    150.00000        400.00000   D  5   200.00000    500.00000   D 37   200.00000    500.00000
115.   D 39    .00000000        200.00000
116.        CA         PPM   40  4
117.   D  2    20.000000        40.000000   D  5   40.000000    70.000000   D 37   40.000000    70.000000
118.   D 39    .00000000        4.0000000
119.        FE         PPM   41  3
120.   D  2    .00000000        2.0000000   D  5   .00000000    1.0000000   D 37   .00000000    1.0000000
121.        MG         PPM   42  4
122.   D  2    2.0000000        8.0000000   D  5   1.0000000    7.0000000   D 37   1.0000000    7.0000000
123.   D 39    .00000000        2.0000000
124.     M TOC         PPM   43  1
125.   D 17    3000.0000        12000.000
126.        CL         PPM   44  2
127.   D 37    50.000000        80.000000   D 39   .00000000    8.0000000
128.        SO4         PPM   45  2
129.   D 37    40.000000        60.000000   D 39   .00000000    2.0000000
130.        NA         PPM   46  2
131.   D 37    25.000000        50.000000   D 39   .00000000    15.000000
132.         K         PPM   47  2
133.   D 37    5.0000000        15.000000   D 39   .00000000    5.0000000
134.        AG         PPB   48  3
135.   G  2    .00000000        5.0000000   G  5   .00000000    .50000000   G 37   .00000000    .50000000
```

```
136.          AS          PPB   49  3
137.  G  2  .00000000              6.0000000  G  5  .00000000  5.0000000  G 37  .00000000  5.0000000
138.          BA          PPB   50  3
139.  G  2  .00000000              300.00000  G  5  .00000000  200.00000  G 37  .00000000  200.00000
140.          CD          PPB   51  3
141.  G  2  .00000000              5.0000000  G  5  .00000000  1.0000000  G 37  .00000000  1.0000000
142.          CR          PPB   52  3
143.  G  2  .00000000              100.00000  G  5  .00000000  20.000000  G 37  .00000000  20.000000
144.          CU          PPB   53  3
145.  G  2  .00000000              100.00000  G  5  .00000000  50.000000  G 37  .00000000  50.000000
146.          HG          PPB   54  3
147.  G  2  .00000000              1.5000000  G  5  .00000000  1.5000000  G 37  .00000000  1.5000000
148.          MN          PPB   55  3
149.  G  2  .00000000              300.00000  G  5  .00000000  20.000000  G 37  .00000000  20.000000
150.          PB          PPB   56  3
151.  G  2  .00000000              40.000000  G  5  .00000000  1.5000000  G 37  .00000000  1.5000000
152.          SE          PPB   57  3
153.  G  2  .00000000              15.000000  G  5  .00000000  15.000000  G 37  .00000000  15.000000
154.          ZN          PPB   58  3
155.  G  2  .00000000              400.00000  G  5  .00000000  20.000000  G 37  .00000000  20.000000
156.           F          PPM   59  3
157.  G  2  .00000000              1.5000000  G  5  .00000000  1.5000000  G 37  .00000000  1.5000000
158.        MBAS          PPM   60  3
159.  G  2  .00000000              15.000000  G 24  .00000000  1.0000000  G 37  .00000000  1.0000000
160.          CN          PPB   61  2
161.  G  2  .00000000              15.000000  G 37  .00000000  10.000000
162.  PHENOL           PPB   62  2
163.  G  2  .00000000              20.000000  G 37  .00000000  10.000000
164.       UV 1    (212) NM   63  3
165.  G 24  .00000000              10.000000  G 30  .00000000  10.000000  G 37  .00000000  10.000000
166.       UV 2    (290) NM   64  3
167.  G 24  90.000000              100.00000  G 30  90.000000  100.00000  G 37  90.000000  100.00000
168.  ALDRIN          PPT  -65  2
169.  G 24  .00000000              20.000000  G 37  .00000000  10.000000
170.  CHLDAN          PPT  -66  2
171.  G 24  .00000000              20.000000  G 37  .00000000  20.000000
172.          DDT          PPT  -67  2
173.  G 24  .00000000              20.000000  G 37  .00000000  20.000000
174.  DIELDR          PPT  -68  2
175.  G 24  .00000000              2.0000000  G 37  .00000000  2.0000000
176.  ENDRIN          PPT  -69  2
177.  G 24  .00000000              10.000000  G 37  .00000000  10.000000
178.  HEPTAC          PPT  -70  2
179.  G 24  .00000000              5.0000000  G 37  .00000000  5.0000000
180.  HPEPOX          PPT  -71  2
```

181.	G 24	.00000000			2.0000000	G 37	.00000000	2.0000000
182.	LINDAN	PPT	-72	2				
183.	G 24	.00000000			10.000000	G 37	.00000000	10.000000
184.	MEOXCL	PPT	-73	2				
185.	G 24	.00000000			80.000000	G 37	.00000000	80.000000
186.	SILVEX	PPT	-74	2				
187.	G 24	.00000000			100.00000	G 37	.00000000	100.00000
188.	TOXPHN	PPT	-75	2				
189.	G 24	.00000000			100.00000	G 37	.00000000	100.00000
190.	24D	PPT	-76	2				
191.	G 24	.00000000			100.00000	G 37	.00000000	100.00000
192.	245T	PPT	-77	2				
193.	G 24	.00000000			100.00000	G 37	.00000000	100.00000
194.	245TP	PPT	-78	2				
195.	G 24	.00000000			100.00000	G 37	.00000000	100.00000
196.	DIAZIN	PPT	-79	2				
197.	G 24	.00000000			10.000000	G 37	.00000000	10.000000
198.	GUTHON	PPT	-80	2				
199.	G 24	.00000000			400.00000	G 37	.00000000	400.00000
200.	MALATN	PPT	-81	2				
201.	G 24	.00000000			20.000000	G 37	.00000000	20.000000
202.	PARATN	PPT	-82	2				
203.	G 24	.00000000			20.000000	G 37	.00000000	20.000000
204.	SEVIN	PPT	-83	2				
205.	G 24	.00000000			100.00000	G 37	.00000000	100.00000
206.	ODOR	UNITS	84	1				
207.	G 35	.00000000			5.0000000			
208.	CL DMD	PPM	85	1				
209.	G 35	.00000000			10.000000			
210.	CCE	PPM	-86	1				
211.	G 37	.00000000			5.0000000			
212.	CAE	PPM	-87	1				
213.	G 37	.00000000			5.0000000			
214.	P ARGN	ORG/100 ML	88	1				
215.	G 37	.00000000			5.0000000			
216.	T CLFM	ORG/100 ML	89	1				
217.	G 37	.00000000			5.0000000			
218.	F CLFM	ORG/100 ML	90	1				
219.	G 37	.00000000			5.0000000			
220.	TTL CT	ORG/100 ML	91	1				
221.	G 37	.00000000			200.00000			
222.	SALMNL	ORG/100 ML	92	1				
223.	G 37	.00000000			5.0000000			
224.	PSDMDS	ORG/100 ML	-93	1				
225.	G 37	.00000000			10.000000			

226.	FR CL2	PPM	94	1							
227.	G 37	.00000000		10.000000							
228.	COLOR	UNITS	95	1							
229.	G 37	.00000000		5.0000000							
230.	VIRUS	PFU/100 GAL	-96	3							
231.	G 2	5000.0000		80000.000	G 35	.00000000	10.000000	G 37	.00000000	10.000000	
232.	G ALPH	PCI/L	-97	1							
233.	G 37	.00000000		2.0000000							
234.	G BETA	PCI/L	-98	1							
235.	G 37	.00000000		10.000000							
236.	TRIBNZ	PPB	-99	2							
237.	G 2	.00000000		50.000000	G 37	.00000000	50.000000				
238.	CH3OH	PPM	-100	1							
239.	G 37	.00000000		10.000000							
240.	PAHS	PPB	-101	4							
241.	G 2	.00000000		1000.0000	24	.00000000	500.00000	30	.00000000	300.00000	
242.	37	.00000000		300.00000							
243.	ORG ID	PPB	-102	5							
244.	G 2	.00000000		1000.0000	G 24	.00000000	500.00000	G 30	.00000000	300.00000	
245.	G 37	.00000000		300.00000	G 39	.00000000	200.00000				
246.	HRDNSS	PPM	103	2							
247.	G 2	70.000000		130.00000	G 37	80.000000	170.00000				
248.	CA STB	UNITS	104	1							
249.	G 37	-10.000000		10.000000							
250.	AL	PPM	105	1							
251.	D 35	.00000000		1.0000000							

2. Parameter I.D., Chemical Units, Initial Record Pointer, Number of Stations Sampled at (N).
(A6, A12, I5, I3)

3. Sample Frequency, Sampling Station Number (packed into single word), Acceptable Minimum and Maximum, repeated up to 3 times per record.
((3(A4,2616.8))) - the A4 is later decoded into A1,I3.

For this file there is only one type 1 record. The type two record is repeated N times, each being followed by a number of type 3 records until all N sampling stations are accounted for. Following is a listing (Figure III-4) of an actual FILEB utilized in implementing the system. Note the composition of the file is variable as it is being constantly updated by DATASTORE and can be expanded by PREP.

F. BFDATA

This file is where the water quality data is actually stored. It is a UNIVAC SDF file, utilizing unformatted direct access processing. Initially each parameter is assigned one record. When that record is filled, another is assigned so as a particular study increases in length and more data is collected for a given parameter, more records are assigned to that parameter. A set number of records (300) are initially assigned to the file. When all records have been used, the file is dynamically expanded, thus reducing the need to have a lot of assigned empty space.

Each record is 132 words long, with 129 being used to store data points (3 words per point; 43 data points total) and the other three being used for system information. The word is divided as follows:

Word 1 - Current Number of Data Points (N, 1 _N_43) in this record.
Word 2 - Earliest and Latest Date contained in this record in packed Julian format (YYDDDYYDDD).
Words 3-131 - The 43 data points containing:
1. Sampling Station Number
2. Julian Date/Time in the form YYDDDHHMM
3. Floating Point Data Value

Word 132 - Pointer to Continuation Record.

Given all of the above information, any program using this file can efficiently locate any set of points.

Section 4

Introduction to the UNIVAC 1110

A. General Information

Two different types of remote terminals are utilized by the BLUE PLAINS Data Storage and Retrieval System for communicating with the UNIVAC 1110 at Research Triangle Park, North Carolina. They are:

Low Speed Terminals (300 baud)
- Anderson-Jacobson 830
- Anderson-Jacobson 630
- Texas Instrument Silent 700
- Tektronix 4012

Medium Speed Terminals (between 2000 and 4800 baud)
- Data 100/78 configured as a UNIVAC 1004
- Data General 840 configured as a UNIVAC 1004

Both terminal types are linked to the main computer system via telephone lines. For the low speed terminals, a character is struck, translated to electrical impulses by the terminal, sent through an acoustic coupler to a normal dial-up telephone, and down the phone lines to the main computer. This pathway is reversed when the computer sends a character to the terminal. The medium speed terminals work in very much the same way but instead of single characters of information being the unit of information a more sophisticated version of an acoustic coupler is used, and a dial up telephone may or may not be used. Thus for both terminal types a two-way communications link may be established with the main computer.

Certain abbreviations and conventions will be used in this section. All dialogue to and from the computer will be on the left side of the page, with dialogue from the computer UNDERLINED. A (CR) indicates a carriage return. The letters CTRL-x, where x is any key on the keyboard, means strike the CTRL key and the other key simultaneously. Thus, CTRL-C means strike the CTRL key and the C key simultaneously.

Caution: Be sure to differentiate between a zero and the letter O. Interchanging these two symbols could result in a disaster.

B. The UNIVAC 1110

The UNIVAC 1110 is a large scale computer which may service many different requests for data processing tasks from users all over the country. These tasks or "runs" are scheduled and serviced by a master program (operating system or executive) called EXEC 8. The user tells EXEC 8 exactly what it is he wants done by using a language called Executive Control Language (ECL). An ECL command is distinguished from other languages and control statements by the presence of an at sign (@) in column 1 followed by a mnemonic name i.e. @XQT for execute, @ASG for assign, @FOR for a FORTRAN compile, etc. A set of these commands defines a run and in UNIVAC terminology is called a runstream. A run begins with an @RUN statement defining the run and ends with an @FIN statement denoting run termination.

Runstreams may be processed in one of two different modes. In Batch mode, the user assembles a whole runstream and submits it all at once for processing. Exec 8 places this runstream in a queue (or holding place) until it is free to process the ECL it contains. Processing takes place without user interaction, and the user sees the results of the run only when all processing has terminated. In Demand mode, the user enters the ECL commands one at a time via a low speed (sometimes called a demand) terminal. Each command is processed by Exec 8 as it is entered. This mode of processing is sometimes called interactive processing because the user "interacts" with the host computer. It is also called timesharing because many different users are being serviced simultaneously, (i.e. sharing the computer) without having an effect on each other. Exec 8 or other programs running on the UNIVAC in demand mode signify they are ready to receive input by prompting the user with a greater than (>) sign.

The runstream is submitted to the UNIVAC utilizing either a low speed terminal by keying in the ECL statements or a medium speed terminal with all ECL and program input punched on cards. Each of these terminal types is known to the UNIVAC by a unique six character site identification number assigned to each terminal by RTP similar to a HASP remote job entry terminal number. Output from a run submitted from one site is returned to the same site, unless the user specifies otherwise.

The BLUE PLAINS Data Storage and Retrieval System utilizes both batch and demand mode processing, as some programs will only execute in batch while others may be executed in either mode.

For further information on the UNIVAC 1110 and EXEC 8, refer to the publication Sperry UNIVAC 1100 Series Executive System, UP-4144.

C. Demand Terminal Session Initialization and Termination

This section contains instructions for initializing and terminating demand terminal sessions. This process is analogous to logon/logoff procedures for a system like IBM's TSO or login/killjob procedures for the DEC System 10. Since each of the four low speed terminal types now in use by CSSD must be set up differently, they will be dealt with individually, up to the point of dialing up the UNIVAC. After that point, they all behave similarly.

1. Terminal Setup for the Anderson-Jacobson 830

   a. Set LIN/LOC switch to LIN.
   b. Set terminal power switch to ON.
   c. If the red power light on the coupler does not come on, switch on power to coupler - this switch should remain in the ON position.
   d. Lift the lid of the terminal and set the toggle switches as follows:

CODE	ASCII
RATE	HI
U/C ALPHA	ON
LF	1
PITCH	10
PAR CHK	OFF
AUTO RET	ON
DUP	HALF

   e. Strike the following keys:

      ESC - C - 0 - 0 - 1 (zero, zero, one).
      This sets the internal form length to one line to suppressform feeds from the UNIVAC.

2. Terminal Setup for the Anderson-Jacobson 630

   a. Set LIN/LOC switch to LIN.
   b. Set terminal power switch to ON.
   c. If the red power light on the coupler does not come on, switch on power to coupler - this switch should remain in the ON position.
   d. Lift the lid of the terminal and set the toggle switches as follows:

RATE	30
DUPLEX	HALF
ALPHA	
LOW	OFF
AUTO	

RET	ON
PAR	
CHK	OFF

3. Terminal Setup for the Texas Instrument Silent 700

   a. Switch power ON.
   b. If on-line light is not lit, depress on-line key (on top row of keyboard).
   c. Set BAUD switch to 300.
   d. Set DUPLEX switch to half.
   e. If terminal is equipped for upper/lower operation, set upper case switch ON.

4. Terminal Setup for the Tektronix 4012

   a. Set transmit and receive speed rotary switches to 300 baud.
   b. Set duplex switch to half, normal.
   c. Make sure TTY lock key is depressed.
   d. Turn power ON - when screen illuminates, strike reset key.

5. Session Initialization

   Now that the terminal is properly set up dial up one of the following numbers:

FTS	WATS
8-629-2176	9-1-800-334-8521
8-629-2223	9-1-800-334-8525
8-629-2416	
8-629-2521	
8-629-2512	
8-629-2661	
8-629-2713	
8-629-2917	

If any number is busy, try another. If all lines are busy, try again later in the day, or call George Scruggs (8-629-2385) and ask for an open line. If two or more numbers ring but do not answer, the system is probably down. Dial the status number (8-629-2226) to find out when the system will be back up.

If a high-pitched tone is heard, place the handset into the cradle of the coupler and perform the following sequence of commands.

XXXXXX	Type in your 6 character site I.D. - it can be found on a sticker affixed to the terminal. A (CR) is not needed.

UNIVAC 1100 OPERATING SYSTEM - VER.32.R2B

System responds to your site I.D. by printing a header.

@@TTY C,(BS)(CR) Set the backspace as a character for AJ830,
or AJ630, TK4012. Set @@TTY C, (CR) the back arrow for TI700.

-@@ COMPLETE

@@TTY W,132 (CR) For AJ830 and AJ630, set carriage width of 132 characters. The default width is 80 characters.

-@@COMPLETE

@RUN BLUE,64034BLUEP,BLUEPL,10 (CR)

Initiate the demand run. Your run I.D. is BLUE, under account 64034BLUEP, project BLUEPL and you are requesting 10 SUP minutes of processing.

DATE:060176 TIME: 150000

System responds with the date and time. Note that here is where the system begins prompting for input.

@SETC,X (CR) This line suppresses printing of some useless system information.

Now you may proceed onto processing.

6. Session Termination

To terminate a demand session, enter the following commands:

@FIN Tell the system you are finished.

```
RUNID: BLUE   ACCT: 64034BLUEP  PROJECT: BLUEPL
TIME:  TOTAL          CBSUPS
       CAU:           I/O
       CC/ER:         WAIT
SRC:   PS=            ES=
IMAGES READ:          PAGES:
START: 15:00:00  JUN 01, 1976  FIN: 16:00 JUN 01, 1976
```

System prints out final run accounting information, then tells you it is finished having nothing else to do.

@@TERM (CR) Tell the system its OK to drop the line. The carrier light should then go out. Hang up the phone and turn the power off for the terminal.

D. Error correction Procedures

For an incorrect character, just backspace to the incorrect character, and retype from that point, for the AJ830, AJ630 and TK4012. For the TI700, strike the back arrow (←) key to simulate a backspace, i.e. if a mistake was made five characters ago, strike the back arrow five times, then retype from that point.

To delete an entire line, strike CTRL-X. The system will give a carriage return, line feed but no additional prompt. Just retype the entire line.

Section 5

OPERATING INSTRUCTIONS FOR THE BLUE PLAINS DATA STORAGE AND RETRIEVAL SYSTEM

A. GENERAL INSTRUCTIONS

This section contains the instructions for running the programs of the Blue Plains Data Storage and Retrieval System. If you have not yet read Section Four of this manual (Introduction to the UNIVAC 1110), do so before going any further in this section.

The remainder of this section is divided into several subsections, each detailing instructions for running a different program. Within each subsection both batch and demand execution will be dealt with. In the batch segment, any special input forms needed will be shown as well as a sample runstream. Note for brevity the entire run card will not be shown: @RUN ... will stand for an entire valid run card, the format of which is shown in Section Four. In the demand segment, an actual demand run will be shown. All messages printed by the program are typed normally. Your input to the program is preceeded by the standard solicitation character (>).

Before any programs are executed in demand mode, the user should copy the program library to the system temporary file TPF$. by entering the following command: @ COPY BLUEPROG.,TPF$.

B. PROGRAM PREP

The function of this program is the creation and maintenance of the Master Directory which contains the configuration of the treatment system. Because of the expected large volume of input, the creation of the directory is limited to batch mode. The maintenance of the directory includes changing titles or parameter names or adding subsystems, sampling stations or parameters and is limited to demand mode.

1. BATCH PROCESSING

For ease in the creation of the Master Directory, a matrix should be drawn showing the system configuration before filling out the coding sheets. Figure V-1 shows such a matrix. Note there are two subsystems, with 4 and 3 sampling stations respectively arranged across the top of the page with four different parameters. The actual entries within the matrix are the valid sample frequency codes. Caution - if at a given sampling station the same actual parameter is measured under different frequencies (i.e., one is a grab, one is a composite), enter as two distinct parameters, for instance: DO1 and DO2 for two different measures of dissolved oxygen. This differentiation should also be used where the measurements are taken using different chemical units, i.e. FLOW 1 measured in gallons/hour and FLOW 2 in thousand gallons/day.

SUBSYSTEM/SAMPLING STATIONS

	A				B		
	1	2	3	4	1	2	3
Parameter							
PH	G		G	D	D		
DO	G				G		
FLOW		G				G	G
TEMP			G	G	G		G

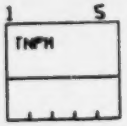
Figure V-1

You are now ready to fill out the coding forms. First, parameter information to be stored in FILEB is filled out. The total number of parameters is coded onto FILEB Card Type 1 (Figure V-2). Be sure this number is right justified on the five position field (all fields should be right justified on all coding forms unless otherwise noted). Now, for each of the parameters a FILEB Card Type 2 (Figure V-3) is filled out.

Each Card Type 2 is followed by one or a number of File B Card Type 3's (Figure V-4). Each subsystem/sampling station

BLUE PLAINS PILOT TREATMENT PLANT

CARD TYPE 1 - FILEB PARAMETER INFORMATION



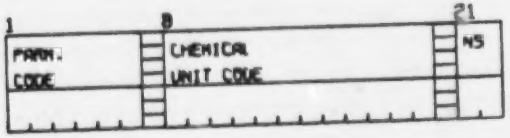
THIS CARD IS ONLY FILLED OUT ONCE

KEY

TNPM - TOTAL NUMBER OF PARAMETERS MEASURED

Figure V-2

BLUE PLAINS PILOT TREATMENT PLANT
CARD TYPE 2 - FILEB PARAMETER INFORMATION



ONE CARD WILL BE COMPLETED FOR EACH PARAMETER

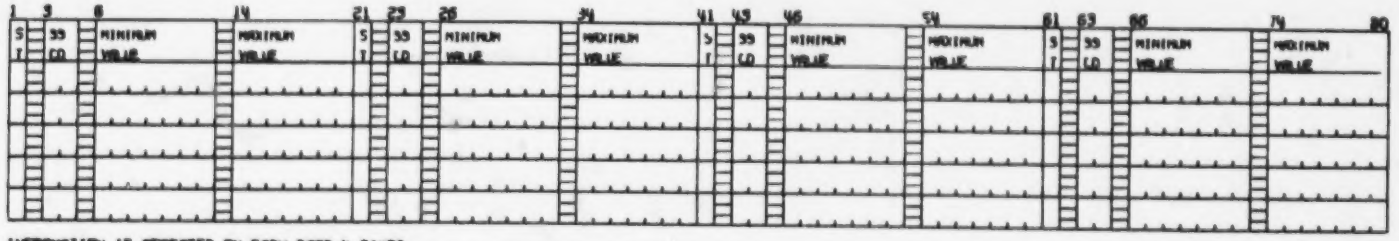
KEY

NS - NUMBER OF SAMPLING STATIONS WHERE THIS PARAMETER IS MEASURED

Figure V-3

BLUE PLAINS PILOT TREATMENT PLANT

CARD TYPE 3 - FILEB PARAMETER INFORMATION



INFORMATION IS REPEATED ON EACH CARD 4 TIMES.
FOR MORE THAN 20 PARAMETER LOCATIONS USE MULTIPLE CODING SHEETS

KEY

ST - SAMPLE TYPE
SS CD - SUBSYSTEM/SAMPLING STATION CODE

Figure V-4

where a parameter is to be measured must be represented. Up to four subsystem/sampling stations may be coded on a single card. For more than four stations, use additional cards. In this card, ST represents sample frequency (sample frequencies and sample type are used synonymously). The minimum and maximum values are used to:

1. Check for keypunch errors. If at a given station values around 5 are expected, 0.0 and 10.0 may be coded as minimum and maximum check values. Do not make the range too tight; any data value outside this range will initially be rejected as a keypunch error.

2. Set a lower or upper limit of resolution. If a particular test has a lower limit of .1, set that as the lower limit. Then when entering data, instead of entering .1 (an error for this system) .09 may be entered with an accept flag (covered later).

Once all FILEB cards have been filled out, begin filling out the FILEA cards which contain subsystem/sampling station descriptions. One FILEA Card Type 1 (Figure V-5) is filled out. The date filled in is the starting date of a study or block of information and is used to check all other dates entered into the system. Now fill out one FILEA Card Type 2 (Figure V-6) for each subsystem, each followed by one FILEA Card Type 3 (Figure V-7) for each sampling station. Each type 3 card is followed by one or many FILEA Card Type 4 cards (Figure V-8) which detail the parameters measured at that particular subsystem/sampling station. At first the whole arrangement may seem confusing; but it is really a simple, straightforward, hierarchical arrangement where each card type expands upon the previous one.

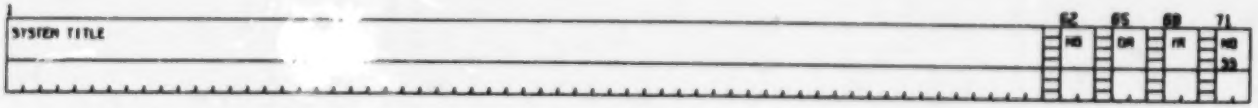
When all forms are coded, they should be keypunched and submitted for processing. Following is a sample runstream, constructed from the example matrix on Figure V-1. Upon successful run termination the user is informed FILEA and FILEB are ready to use.

2. DEMAND PROCESSING

The demand portion of PREP is used to maintain the Master Directory. It is a bit easier to use than the batch portion in that the program "asks" the user for the information all in the correct order.

BLUE PLAINS PILOT TREATMENT PLANT

CARD TYPE 1 - FILEA SYSTEM TITLE



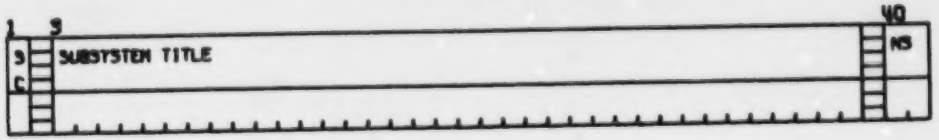
THIS CARD IS ONLY FILLED OUT ONCE

KEY

MO - MONTH
DA - DAY
YR - YEAR
NO SS - TOTAL NUMBER OF SUBSYSTEMS IN THIS CONFIGURATION

Figure V-5

BLUE PLAINS PILOT TREATMENT PLANT
CARD TYPE 2 - FILEA SUBSYSTEM INFORMATION



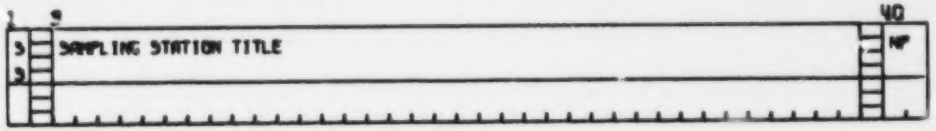
ONE CARD WILL BE COMPLETED FOR EACH SUBSYSTEM

KEY

SC - SUBSYSTEM CODE
NS - NUMBER OF SAMPLING STATIONS FOR THIS SUBSYSTEM

Figure V-6

BLUE PLAINS PILOT TREATMENT PLANT
CARD TYPE 3 - FILEA SAMPLING STATION INFORMATION



ONE CARD WILL BE COMPLETED FOR EACH SAMPLING STATION

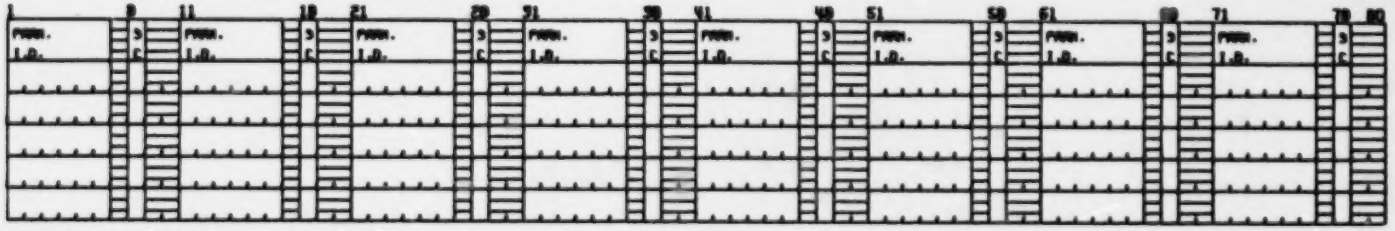
KEY

SS - SAMPLING STATION CODE
NP - NUMBER OF PARAMETERS MEASURED AT THIS STATION

Figure V-7

BLUE PLAINS PILOT TREATMENT PLANT

CARD TYPE 4 - FILEA PARAMETER INFORMATION



INFORMATION IS REPEATED ON EACH CARD 8 TIMES.
FOR MORE THAN 40 PARAMETERS USE MULTIPLE CODING SHEETS

KEY

SC - SAMPLE FREQUENCY CODE

Figure V-8

The following example demonstrates the options available to the user for demand execution of PREP. The Master Directory being used is from the current Blue Plains Pilot Treatment Plant.

SAMPLE RUNSTREAM FROM THE EXAMPLE MATRIX ON FIGURE V-1

```
@RUN BLUE.6403BLUEP,BLUEPL


@ADD PREP.
      4
      PH            PPM  4
G A1         0.0    10.0G A3     0.0    10.0D A4     0.0    10.0D B1     0.0    10.0
      DO            PPM  2
G A1         0.0    10.0G B1     0.0    10.0
      FLOW          GPM  3
G A2        30.0   300.0G B2    30.0   300.0G B3    30.0   300.0
   TEMP          DEGREES  4
G A3        32.0   212.0G A4    32.0   212.0G B1    32.0   2.2.0G B3    32.0   212.0
TEST DATA FOR BLUE PLAINS DOCUMENTATION                          02 04 77 2
A FIRST TEST SUBSYSTEM                                  4
1 FIRST TEST SAMPLING STATION                           2
    PH G       DO G
2 SECOND TEST SAMPLING STATION                          1
  FLOW G
3 THIRD TEST SAMPLING STATION                           2
    PH G     TEMP G
4 FOURTH TEST SAMPLING STATION                          2
    PH D     TEMP G
B SECOND TEST SUBSYSTEM                                 3
1 FIRST TEST SAMPLING STATION                           3
    PH D       DO G     TEMP G
2 SECOND TEST SAMPLING STATION                          1
  FLOW G
3 THIRD TEST SAMPLING STATION                           2
  FLOW G     TEMP G

@FIN
```

EXAMPLE OF PREP IN ADDITION OF EXISTING PARAMETER MODE.

```
@XQT PREP
ENTERED PROGRAM PREP IN DEMAND MODE.
LISTING OF VALID FUNCTION CODES:
1 - ALLOWS ADDITION TO THE MASTER FILE DIRECTORY
2 - ALLOWS CHANGES TO TITLES OR HEADINGS
3 - END OF PROCESSING
H - HELP (PRINT THIS LISTING)

ENTER FUNCTION CODE FOR DESIRED OPERATION
TYPE "H" FOR HELP.
>1
********** BEGINNING ADDITION SEGMENT **********
ONLY THE FOLLOWING MAY BE ADDED:
      1-A SUBSYSTEM
      2-A SAMPLING STATION
      3-AN EXISTING PARAMETER TO A SAMPLING STATION
      4-A NEW PARAMETER

ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED ADDITION.
TYPE "H" FOR HELP.
>3
** ADDITION OF AN EXISTING PARAMETER TO A SAMPLING STATION **
ENTER THE CODE FOR THE SUBSYSTEM IN WHICH THE SAMPLING STATION
YOU WISH TO ADD THE PARAMETER TO IS LOCATED.
>H
ENTER THE CODE FOR THE SAMPLING STATION TO WHICH YOU WISH TO ADD
THE PARAMETER.
>0
ENTER THE PARAMETER NAME YOU WISH TO ADD.
>    PH
ENTER THE SAMPLE FREQUENCY CODE FOR     PH
>D
ENTER THE MINIMUM EXPECTED VALUE FOR     PH
>0.0
ENTER THE MAXIMUM EXPECTED VALUE FOR     PH
>100.0
DO YOU WISH TO MAKE MORE ADDITIONS?
(YES=1,NO=0(ZERO)).
>0
ENTER FUNCTION CODE FOR DESIRED OPERATION
TYPE "H" FOR HELP.
>3
PROCESSING COMPLETED,
PROGRAM EXECUTION TERMINATING NORMALLY.
>
```

```
 EXAMPLE OF PREP IN PARAMETER ADDITION MODE.
 @XQT PREP
 ENTERED PROGRAM PREP IN DEMAND MODE.
 LISTING OF VALID FUNCTION CODES:
 1 - ALLOWS ADDITION TO THE MASTER FILE DIRECTORY
 2 - ALLOWS CHANGES TO TITLES OR HEADINGS
 3 - END OF PROCESSING
 H - HELP (PRINT THIS LISTING)
 ENTER FUNCTION CODE FOR DESIRED OPERATION
 TYPE "H" FOR HELP.
>1
 **********  BEGINNING ADDITION SEGMENT  **********
 ONLY THE FOLLOWING MAY BE ADDED:
       1-A SUBSYSTEM
       2-A SAMPLING STATION
       3-AN EXISTING PARAMETER TO A SAMPLING STATION
       4-A NEW PARAMETER
 ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED ADDITION.
 TYPE "H" FOR HELP.
>4
 ** ADDITION OF A NEW PARAMETER **
 ENTER THE NAME OF THE NEW PARAMETER
 (UP TO 6 CHARACTERS)
>BPTEST
 ENTER THE CHEMICAL UNIT FOR BPTEST
 (UP TO 12 CHARACTERS).
>TEST PARM ADD

 ENTER THE NUMBER OF SAMPLING STATIONS WHERE BPTEST
 IS TO BE MEASURED,(UP TO 9 LOCATIONS)
>1
 ENTER THE CODE FOR THE SUBSYSTEM IN WHICH THE SAMPLING STATION
 YOU WISH TO ADD THE PARAMETER TO IS LOCATED.
>H
 ENTER THE CODE FOR THE SAMPLING STATION TO WHICH YOU WISH TO ADD
 THE PARAMETER.
>0
 ENTER THE SAMPLE FREQUENCY CODE FOR BPTEST
>G
 ENTER THE MINIMUM EXPECTED VALUE FOR BPTEST
>0.0
 ENTER THE MAXIMUM EXPECTED VALUE FOR BPTEST
>100.0

 DO YOU WISH TO MAKE MORE ADDITIONS?
 (YES=1,NO=0(ZERO)).
>0
 ENTER FUNCTION CODE FOR DESIRED OPERATION
 TYPE "H" FOR HELP.
>3
 PROCESSING COMPLETED,
 PROGRAM EXECUTION TERMINATING NORMALLY.
```

```
EXAMPLES OF PREP IN CHANGE MODE.
@XQT PREP
ENTERED PROGRAM PREP IN DEMAND MODE.
LISTING OF VALID FUNCTION CODES:
1 - ALLOWS ADDITION TO THE MASTER FILE DIRECTORY
2 - ALLOWS CHANGES TO TITLES OR HEADINGS
3 - END OF PROCESSING
H - HELP (PRINT THIS LISTING)

ENTER FUNCTION CODE FOR DESIRED OPERATION
TYPE "H" FOR HELP.
>2
********** BEGINNING CHANGE SEGMENT **********
ONLY THE FOLLOWING MAY BE CHANGED:
      1-SYSTEM TITLE
      2-SUBSYSTEM TITLE
      3-SAMPLING STATION TITLE
      4-PARAMETER NAME


ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED CHANGE.
TYPE "H" FOR HELP.
>1
THE PRESENT SYSTEM TITLE IS:
    EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM
ENTER THE ENTIRE CORRECTED TITLE (UP TO 60 CHARACTERS).
>THIS IS AN EXAMPLE OF CHANGING THE SYSTEM TITLE
DO YOU WISH TO MAKE MORE CHANGES?
(YES=1,NO=0(ZERO))
>1


ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED CHANGE.
TYPE "H" FOR HELP.
>2
ENTER THE CODE FOR THE SUBSYSTEM WHOSE TITLE YOU WISH TO CHANGE.
>H
THE TITLE FOR SUBSYSTEM H IS:
          LIME CLARIFICATION
ENTER THE ENTIRE CORRECTED TITLE (UP TO 36 CHARACTERS).
>EXAMPLE OF SUBSYSTEM CHANGE
DO YOU WISH TO MAKE MORE CHANGES?
(YES=1,NO=0(ZERO))
>1


ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED CHANGE.
TYPE "H" FOR HELP.
>3
ENTER THE CODE FOR THE SUBSYSTEM IN WHICH THE SAMPLING STATION
WHOSE TITLE YOU WISH TO CHANGE IS LOCATED.
```

```
>H
 ENTER THE CODE FOR THE SAMPLING STATION WHOSE TITLE YOU WISH TO
 CHANGE.
>0
 IN SUBSYSTEM H THE TITLE FOR SAMPLING STATION 0 IS:
            RAW WASTEWATER
 ENTER THE ENTIRE CORRECTED TITLE (UP TO 36 CHARACTERS).
>SAMPLING STATION CHANGE TITLE
 DO YOU WISH TO MAKE MORE CHANGES?
 (YES=1,NO=0(ZERO))
>1


 ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED CHANGE.
 TYPE "H" FOR HELP.
>4
 ENTER THE PARAMETER ID. YOU WISH TO CHANGE,
 AS IT IS CURRENTLY RECORDED.

>BPTEST
 THE PARAMETER ID. IS:
 BPTEST
 ENTER THE CORRECTED PARAMETER NAME (UP TO 6 CHARACTERS).
>CHTEST
 DO YOU WISH TO MAKE MORE CHANGES?
 (YES=1,NO=0(ZERO))
>0
 ENTERED PROGRAM PREP IN DEMAND MODE.
 LISTING OF VALID FUNCTION CODES:
 1 - ALLOWS ADDITION TO THE MASTER FILE DIRECTORY
 2 - ALLOWS CHANGES TO TITLES OR HEADINGS
 3 - END OF PROCESSING
 H - HELP (PRINT THIS LISTING)

 ENTER FUNCTION CODE FOR DESIRED OPERATION
 TYPE "H" FOR HELP.
>3
 PROCESSING COMPLETED,
 PROGRAM EXECUTION TERMINATING NORMALLY.
>
```

C. PROGRAM SYSTAT

The only function of program SYSTAT is to display all or selected parts of the Master Directory. A listing of the entire system configuration, because of the expected large volume of output, is limited to batch mode. If listings for a single subsystem, sampling station or parameter are desired, they may be obtained in demand mode.

1. BATCH PROCESSING

Only listings for the entire system configuration can be obtained in batch mode. Because of this, no additional input to the program is needed. The runstream to produce the entire system configuration is as follows:

```
@RUN.....
@ADD SYSTAT.
@FIN
```

The output will be arranged with the contents of FILEA (subsystem, sampling station, parameter) printed first followed by the contents of FILEB (parameter, subsystem, sampling station). The following examples utilize the current Blue Plains Pilot Plant Master Directory.

2. DEMAND PROCESSING

If information about a specific subsystem, sampling station, or parameter is the only thing desired, program SYSTAT may be run in demand mode. The user is prompted for all necessary information. The following example utilizes the Master Directory for the current Blue Plains Plant and shows information for a single subsystem, single sampling station, and single parameters.

```
EXAMPLES OF SYSTAT IN DEMAND MODE.

@XQT SYSTAT
ENTERED PROGRAM SYSTAT IN DEMAND MODE

ONLY THE FOLLOWING MAY BE REFERENCED:
     1 - SUBSYSTEM INFORMATION
     2 - SAMPLING STATION INFORMATION
     3 - PARAMETER INFORMATION

 ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED INFORMATION.
 TYPE "H" FOR HELP.
>1
 ENTER THE CODE FOR THE SUBSYSTEM TO BE LISTED.
>M


 SUBSYSTEM CODE M **                ION EXCHANGE
 THIS SUBSYSTEM CONTAINS  2 SAMPLING STATIONS.

 SAMPLING STATION CODE 0 **              ION EXCHANGE FEED
 THIS SAMPLING STATION CONTAINS    2 PARAMETERS.
 PARAMETER NUMBER  1 ** FLOW 1 - SAMPLE FREQUENCY CODE - G
 PARAMETER NUMBER  2 **      PH - SAMPLE FREQUENCY CODE - D

 SAMPLING STATION CODE 7 **           ION EXCHANGE EFFLUENT
 THIS SAMPLING STATION CONTAINS  22 PARAMETERS.
 PARAMETER NUMBER  1 **      PH - SAMPLE FREQUENCY CODE - G
 PARAMETER NUMBER  2 ** ALK MO - SAMPLE FREQUENCY CODE - G
 PARAMETER NUMBER  3 **    TEMP - SAMPLE FREQUENCY CODE - G
 PARAMETER NUMBER  4 **    COND - SAMPLE FREQUENCY CODE - G
 PARAMETER NUMBER  5 **     TOC - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER  6 **     BOD - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER  7 **     COD - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER  8 **    TPO4 - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER  9 **     TKN - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 10 **     NH3 - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 11 ** NO2NO3 - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 12 **      SS - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 13 **     TDS - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 14 **      CL - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 15 **     SO4 - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 16 **      CA - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 17 **      MG - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 18 **      NA - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 19 **       K - SAMPLE FREQUENCY CODE - D
 PARAMETER NUMBER 20 ** ORG ID - SAMPLE FREQUENCY CODE - G
 PARAMETER NUMBER 21 ** DN TME - SAMPLE FREQUENCY CODE - G
 PARAMETER NUMBER 22 **      PH - SAMPLE FREQUENCY CODE - D
 DO YOU WISH TO LIST ANY MORE INFORMATION?
 YES=1, NO=0(ZERO).
```

```
>1
 ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED INFORMATION.
 TYPE "H" FOR HELP.
>2
 ENTER THE CODE FOR THE SUBSYSTEM WHICH CONTAINS
 THE SAMPLING STATION TO BE LISTED.
>H
 ENTER THE CODE FOR THE SAMPLING STATION TO BE LISTED.
>0

 SAMPLING STATION CODE 0 **              RAW WASTEWATER
 THIS SAMPLING STATION CONTAINS    2 PARAMETERS.
 PARAMETER NUMBER   1 ** FLOW 1 - SAMPLE FREQUENCY CODE - G
 PARAMETER NUMBER   2 **   TEMP - SAMPLE FREQUENCY CODE - G
 DO YOU WISH TO LIST ANY MORE INFORMATION?
 YES=1, NO=0(ZERO).
>1
 ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED INFORMATION.
 TYPE "H" FOR HELP.
>H
 LISTING OF VALID FUNCTION CODES:
 1 - LIST SUBSYSTEM INFORMATION
 2 - LIST SAMPLING STATION INFORMATION
 3 - LIST PARAMETER INFORMATION
 H - HELP (PRINT THIS LISTING)

 ENTER THE NUMERIC FUNCTION CODE FOR THE DESIRED INFORMATION.
 TYPE "H" FOR HELP.
>3
 ENTER THE ID FOR THE PARAMETER TO BE LISTED.
 RIGHT JUSTIFIED IN THE FOLLOWING FORMAT.
 XXXXXX
>  TEMP
 INFORMATION FOR PARAMETER   TEMP
 THIS PARAMETER IS MEASURED AT  4 LOCATIONS.
 THE CHEMICAL UNIT CODE FOR THIS PARAMETER IS    DEGREES C
 LOCATION #  1 * SUBSYSTEM CODE H SAMPLING STATION CODE 0
                 SAMPLE FREQUENCY CODE G
                 MINIMUM EXPECTED VALUE     13.000000
                 MAXIMUM EXPECTED VALUE     28.000000

 LOCATION #  2 * SUBSYSTEM CODE A SAMPLING STATION CODE 0
                 SAMPLE FREQUENCY CODE G
                 MINIMUM EXPECTED VALUE     13.000000
                 MAXIMUM EXPECTED VALUE     28.000000

 LOCATION #  3 * SUBSYSTEM CODE L SAMPLING STATION CODE 7
                 SAMPLE FREQUENCY CODE G
                 MINIMUM EXPECTED VALUE     13.000000
                 MAXIMUM EXPECTED VALUE     28.000000
```

```
 LOCATION #  4 * SUBSYSTEM CODE M SAMPLING STATION CODE 7
                SAMPLE FREQUENCY CODE G
                MINIMUM EXPECTED VALUE     13.000000
                MAXIMUM EXPECTED VALUE     28.000000

 DO YOU WISH TO LIST ANY MORE INFORMATION?
 YES=1, NO=0(ZERO).
>0
 PROCESSING TERMINATING NORMALLY - EXIT PROGRAM SYSTAT
>
```

D. PROGRAM DATASTORE

This program is the largest program of the system in terms of number of statements and performs the storing of the water quality data, as well as providing the user the capability of editing any data previously entered. Data storage may be done in batch or demand mode, but editing may only be performed in demand mode.

1. BATCH PROCESSING

The only function (other than end of processing) which can be performed in batch mode is data entry. Before entering into the system, the data should be transcribed onto the special data recording forms (Figure V-9). The form should be filled out in the following manner. The parameter and date should be entered into the proper fields on card type 1. Then the data units composed of two character sampling station code, sample frequency code, time (on a twenty-four hour clock 0000-2359) for grab samples, the actual data value (including decimal point) and an accept flag (X) if desired are entered four units per card onto card type 2. If more than twenty data units are to be entered for a particular parameter/date set, use another form, drawing a line through the empty card type 1. There should be no blank data units in a contiguous set i.e. if ten data units are to be entered, three type 2 cards will be utilized, two of which are full, the last one filled to column 40. After entering all data units, count them and place that number, right-justified in columns 17-20 of card type 1.

Follow the above procedure for all data to be entered for a particular run. Then the following three control cards are needed. A card with a "1" in column one, a card with "FINISH" in columns 1 to 6, and a card with an "8" in column one. These cards mean start data entry, finished with data entry, end of processing respectively.

There is no real limit to the amount of data that can be entered with a single run but should be kept to around 500-3000 cards because some keypunching mistakes will cause the run to abort, disregarding all data after the mistake.

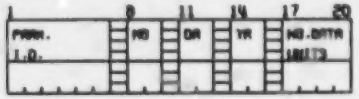
The following sample runstream shows data for three parameter/data sets.

2. DEMAND PROCESSING

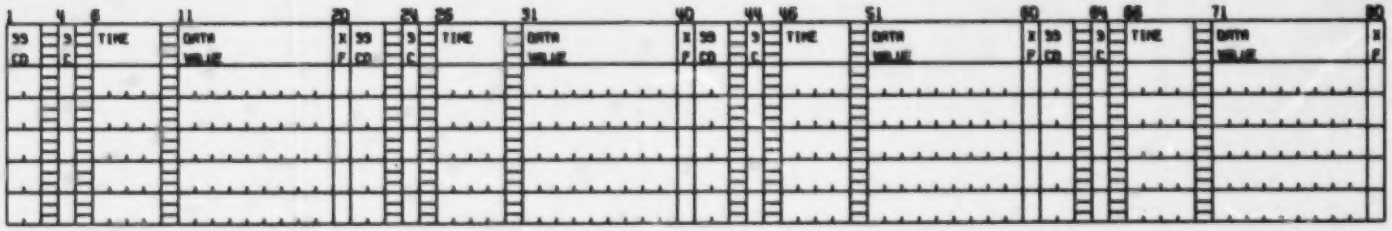
This program is structured so that not only data entry but also data edit may be performed in demand mode. This mode of operation is useful in that a data entry person may enter directly and correct the water quality data on a daily

BLUE PLAINS PILOT TREATMENT PLANT
PARAMETER DATA RECORDING FORM

CARD TYPE 1



CARD TYPE 2



KEY

SS CD - SAMPLING STATION CODE
SC - SAMPLE FREQUENCY CODE
XF - ACCEPT FLAG FOR OUT OF RANGE DATA

A MAXIMUM OF 20 DATA UNITS CAN BE CODED ON THIS FORM
FOR ADDITIONAL DATA UNITS, USE ANOTHER FORM

Figure V-9

basis, thus avoiding large data backlogs due to keypunching delays.

When executing in demand mode, program DATASTORE prompts for a function code. Two of the nine possible function codes have already been mentioned in the description of batch processing, 1 for data entry and 8 for end of processing. They are used identically in demand mode. Of the remaining seven function codes, six are utilized in editing the data with the seventh being reserved for HELP.

As previously mentioned, data entry in demand mode is performed essentially the same as is done in batch. The data is coded onto the data entry forms; but instead of being keypunched and submitted for batch processing, they are entered directly into the program. The user is prompted for all information in the proper order. Mistakes in coding or typing are caught right away and may be immediately corrected. Exiting from the data entry function is done by typing "FINISH" when prompted for a parameter I.D., similarly to using the "FINISH" card in batch processing. The user may then enter code 8 for end of processing or may choose one of several editing functions.

The six editing functions (codes 2 through 7) may be divided into two general categories. In an <u>item</u> edit, only a single data value, defined by a unique data/time and subsystem/sampling station is desired. This is opposed to a <u>sequential</u> edit where a set of data values, within a given date/time period at any number of subsystem/sampling stations may be desired. Both item and sequential edits are related in that once a function code is entered, only a single parameter may be specified. If data for more than one parameter needs editing, multiple function codes would be utilized with all editing for a given function being finished before beginning on the next function.

For either item or sequential edits, three different types of edits may be performed. <u>Replacement</u> allows the correction of value from the data base. <u>Restoration</u> allows the return of a deleted value to the active data base.

A typical case where replacement would be used is where the user enters one or several data items as being sampled at H0 when they were actually taken at H9, assuming H0 and H9 are both valid sampling stations for the parameter in question. The previously entered H0 may be changed to H9. The following fields may be replaced.

<u>Field</u>	<u>Description</u>
1	Month - 2 Digits

2	Day - 2 Digits
3	Year - 2 Digits
4	TIme - 4 Digits
5	Subsystem/Sampling Stations - 2 Characters
6	Frequency Code - 1 Character
7	Actual Data Value - Up to 12 Digits with decimal point

Deletion of one or several data items would be desirable if they had been entered as the wrong parameter, i.e. data for FLOW 1 is inadvertantly entered as FLOW 2. All erroneous data would be deleted, then correctly entered using the data entry function. If one or several data items were mistakenly deleted, they may be restored to the data base by use of either restoration function.

The following function codes have been assigned to each of the editing functions.

2 - Item Replacement
3 - Item Deletion
4 - Item Restoration
5 - Sequential Replacement
6 - Sequential Deletion
7 - Sequential Restoration

The remaining function code is "H" for HELP. If entered when prompted for a function code, a list of allowable function codes will be displayed, followed by a new function code prompt.

The following example demonstrates several of the functions which can be utilized in demand mode. Note in data entry the number of data units has not been right justified so instead of 1 data unit the program is expecting 100. The "fix" for this mistake is to enter "@EOF" when prompted for additional data units. The program will complain about the end of file but it will allow continuation of data entry and will properly enter the data values.

```
@XQT DATASTORE
ENTER FUNCTION CODE - TYPE "H" FOR HELP
>H
LISTING OF VALID FUNCTION CODES:

1 - DATA ENTRY                  BATCH OR DEMAND MODE
2 - ITEM REPLACEMENT            DEMAND MODE ONLY
3 - ITEM DELETION               DEMAND MODE ONLY
4 - ITEM RESTORATION            DEMAND MODE ONLY
5 - SEQUENTIAL REPLACEMENT      DEMAND MODE ONLY
6 - SEQUENTIAL DELETION         DEMAND MODE ONLY
7 - SEQUENTIAL RESTORATION      DEMAND MODE ONLY
8 - END OF PROCESSING           BATCH OR DEMAND MODE
H - HELP (PRINT THIS LISTING)   DEMAND MODE ONLY


ENTER FUNCTION CODE - TYPE "H" FOR HELP
>1


***** D A T A  E N T R Y  F U N C T I O N *****


ENTER PARAMETER I.D., DATE AND NUMBER OF DATA UNITS TO FOLLOW AS FOLLOWS:
XXXXXX MM DD YY XXXX
>  LIME 09 01 75    1
ENTER A LINE OF DATA WITH    1 DATA UNITS
>H5 G 0710      80.0

ENDING DATA ENTRY FOR   LIME,  9/ 1/75 - SUCCESSFULLY ENTERED   1 DATA UNITS

ENTER PARAMETER I.D., DATE AND NUMBER OF DATA UNITS TO FOLLOW AS FOLLOWS:
XXXXXX MM DD YY XXXX
>  LIME 09 02 75  1
ENTER A LINE OF DATA WITH    4 DATA UNITS
>H5 G 0710    160.0
ENTER A LINE OF DATA WITH    4 DATA UNITS
>@EOF

UNEXPECTED END OF FILE REACHED WHILE PERFORMING DATA ENTRY FUNCTION FOR   LIME,  9/ 2/75

ENDING DATA ENTRY FOR   LIME,  9/ 2/75 - SUCCESSFULLY ENTERED   1 DATA UNITS

ENTER PARAMETER I.D., DATE AND NUMBER OF DATA UNITS TO FOLLOW AS FOLLOWS:
XXXXXX MM DD YY XXXX
>  LIME 09 03 75    1
```

```
 ENTER A LINE OF DATA WITH     1 DATA UNITS
>H5 G 0711     85.0

 ENDING DATA ENTRY FOR   LIME,  9/ 3/75 - SUCCESSFULLY ENTERED    1 DATA UNITS

 ENTER PARAMETER I.D., DATE AND NUMBER OF DATA UNITS TO FOLLOW AS FOLLOWS:
 XXXXXX MM DD YY XXXX
>FINISH


 SUCCESSFUL TERMINATION OF DATA ENTRY FUNCTION


 ENTER FUNCTION CODE - TYPE "H" FOR HELP
>2


 ***** I T E M   R E P L A C E M E N T   F U N C T I O N *****


 ENTER PARAMETER I.D. AND DATE/TIME AS FOLLOWS:
 XXXXXX MM DD YY HHMM
>  LIME 09 03 75 0711
 ENTER THE SUBSYSTEM/SAMPLING STATION TO BE  REPLACED
>H5

 RECORD FOUND    MO DA YR TIME SS F      VALUE
                  9  3 75 0711 H5 G    85.000000

 DO YOU WISH TO PERFORM A FIELD BY FIELD EDIT?
>YES

 WHEN YOU ARE FINISHED EDITING THIS RECORD, ENTER 0 (ZERO) FOR RECORD FIELD TO BE EDITED

 ENTER FIELD TO BE EDITED
>TIME
 INVALID FIELD SPECIFIED - T - REENTER WHEN PROMPTED
 ENTER FIELD TO BE EDITED
>4
 ENTER CORRECT VALUE FOR FIELD 4
>0710
 ENTER FIELD TO BE EDITED
>0

 CORRECTED RECORD    MO DA YR TIME SS F      VALUE
                      9  3 75 0710 H5 G    85.000000
```

```
 IS THIS RECORD O.K.?
>YES

 SUCCESSFUL TERMINATION OF PREVIOUS FUNCTION

 ENTER FUNCTION CODE - TYPE "H" FOR HELP
>3

 ***** I T E M  D E L E T I O N  F U N C T I O N *****

 ENTER PARAMETER I.D. AND DATE/TIME AS FOLLOWS:
 XXXXXX MM DD YY HHMM
>  LIME 09 03 75 0710
 ENTER THE SUBSYSTEM/SAMPLING STATION TO BE   DELETED
>H5

 RECORD FOUND   MO DA YR TIME SS F      VALUE
                 9  3 75 0710 H5 G    85.000000

 DO YOU WISH RECORD TO BE   DELETED  ?
>YES
 RECORD   DELETED


 SUCCESSFUL TERMINATION OF PREVIOUS FUNCTION

 ENTER FUNCTION CODE - TYPE "H" FOR HELP
>4

 ***** I T E M  R E S T O R A T I O N  F U N C T I O N *****

 ENTER PARAMETER I.D. AND DATE/TIME AS FOLLOWS:
 XXXXXX MM DD YY HHMM
>  LIME 09 03 75 0710
 ENTER THE SUBSYSTEM/SAMPLING STATION TO BE  RESTORED
>H5
```

```
 RECORD FOUND   MO DA YR TIME SS F      VALUE
                 9  3 75 0710 H5 G    85.000000

 DO YOU WISH RECORD TO BE  RESTORED  ?
>YES
 RECORD  RESTORED


 SUCCESSFUL TERMINATION OF PREVIOUS FUNCTION


 ENTER FUNCTION CODE - TYPE "H" FOR HELP
>5


 ***** S E Q U E N T I A L  R E P L A C E M E N T  F U N C T I O N *****


 ENTER PARAMETER I.D. AND DATE/TIMES AS FOLLOWS:
 XXXXXX MM DD YY HHMM MM DD YY HHMM
>  LIME 09 01 75 0710 09 03 75 0710
 ENTER NUMBER (3 DIGITS) OF SUBSYSTEM/SAMPLING STATIONS TO BE  REPLACED   OR "ALL"
>  1
 ENTER THE  1 SUBSYSTEM/SAMPLING STATIONS TO BE  REPLACED   AS FOLLOWS:
 XX XX XX XX .....
>H5

 RECORD FOUND   MO DA YR TIME SS F      VALUE
                 9  1 75 0710 H5 G    80.000000

 DO YOU WISH TO PERFORM A FIELD BY FIELD EDIT?
>NO

 RECORD FOUND   MO DA YR TIME SS F      VALUE
                 9  2 75 0710 H5 G    160.00000

 DO YOU WISH TO PERFORM A FIELD BY FIELD EDIT?
>YES

 WHEN YOU ARE FINISHED EDITING THIS RECORD, ENTER 0 (ZERO) FOR RECORD FIELD TO BE EDITED

 ENTER FIELD TO BE EDITED
>7
 ENTER CORRECT VALUE FOR FIELD 7
>80.0
```

```
 ENTER FIELD TO BE EDITED
>0

 CORRECTED RECORD    MO DA YR TIME SS F      VALUE
                      9  2 75 0710 H5 G     80.000000
 IS THIS RECORD O.K.?
>YES

 RECORD FOUND    MO DA YR TIME SS F      VALUE
                  9  3 75 0710 H5 G     85.000000

 DO YOU WISH TO PERFORM A FIELD BY FIELD EDIT?
>YES

 WHEN YOU ARE FINISHED EDITING THIS RECORD, ENTER 0 (ZERO) FOR RECORD FIELD TO BE EDITE

 ENTER FIELD TO BE EDITED
>4
 ENTER CORRECT VALUE FOR FIELD 4
>0910
 ENTER FIELD TO BE EDITED
>7
 ENTER CORRECT VALUE FOR FIELD 7
>80.0
 ENTER FIELD TO BE EDITED
>0

 CORRECTED RECORD    MO DA YR TIME SS F      VALUE
                      9  3 75 0910 H5 G     80.000000
 IS THIS RECORD O.K.?
>YES


 SUCCESSFUL TERMINATION OF PREVIOUS FUNCTION


 ENTER FUNCTION CODE - TYPE "H" FOR HELP
>6


 ***** S E Q U E N T I A L   D E L E T I O N   F U N C T I O N *****


 ENTER PARAMETER I.D. AND DATE/TIMES AS FOLLOWS:
 XXXXXX MM DD YY HHMM MM DD YY HHMM
>  LIME 09 01 75 0710 09 03 75 0910
```

```
 ENTER NUMBER (3 DIGITS) OF SUBSYSTEM/SAMPLING STATIONS TO BE   DELETED   OR "ALL"
>  1
 ENTER THE  1 SUBSYSTEM/SAMPLING STATIONS TO BE   DELETED   AS FOLLOWS:
 XX XX XX XX .....
>H5

 RECORD FOUND   MO DA YR TIME SS F      VALUE
                 9  1 75 0710 H5 G    80.000000

 DO YOU WISH RECORD TO BE   DELETED  ?
>NO

 RECORD FOUND   MO DA YR TIME SS F      VALUE
                 9  2 75 0710 H5 G    80.000000

 DO YOU WISH RECORD TO BE   DELETED  ?
>YES
 RECORD   DELETED


 RECORD FOUND   MO DA YR TIME SS F      VALUE
                 9  3 75 0910 H5 G    80.000000

 DO YOU WISH RECORD TO BE   DELETED  ?
>NO


 SUCCESSFUL TERMINATION OF PREVIOUS FUNCTION


 ENTER FUNCTION CODE - TYPE "H" FOR HELP
>7


 ***** S E Q U E N T I A L   R E S T O R A T I O N   F U N C T I O N *****


 ENTER PARAMETER I.D. AND DATE/TIMES AS FOLLOWS:
 XXXXXX MM DD YY HHMM MM DD YY HHMM
>  LIME 09 01 75 0710 09 03 75 0910
 ENTER NUMBER (3 DIGITS) OF SUBSYSTEM/SAMPLING STATIONS TO BE  RESTORED   OR "ALL"
>  1
 ENTER THE  1 SUBSYSTEM/SAMPLING STATIONS TO BE  RESTORED   AS FOLLOWS:
 XX XX XX XX .....
>H5
```

```
 RECORD FOUND    MO DA YR TIME SS F      VALUE
                  9  2 75 0710 H5 G     80.000000

 DO YOU WISH RECORD TO BE  RESTORED  ?
>YES
 RECORD  RESTORED


 SUCCESSFUL TERMINATION OF PREVIOUS FUNCTION


 ENTER FUNCTION CODE - TYPE "H" FOR HELP
>8


 PROGRAM EXECUTION IN DEMAND MODE TERMINATING  NORMALLY

>
```

E. PROGRAM REPGEN

The function of this program is to generate reports containing statistical summaries of the information stored in the database file BPDATA. Two types of report formats may be specified, one arranged by subsystems and the other by parameters. Both types may be obtained either with or without raw data listings. Summary reports, which utilize all data stored for a specific time period, are limited to batch mode due to the length of the printed report.

1. BATCH PROCESSING

All function codes may be utilized in batch mode; however, the first four function codes, specifying summary reports in either parameter or subsystem format and either with or without raw data listings, are restricted to batch mode only. This is necessary because the amount of data to be printed would involve a lengthy terminal session if printed on a demand terminal.

By completing the Report Request Form (Figure V-10) and punching the appropriate cards, it is possible for the user to request any of the desired reports in batch mode. For example, if a parameter report for FLOW 1 without raw data listings at all locations is requested for the month of June 1975, the form would be completed as in Figure V-10. Note that only the card type 3 for parameter reports is completed. If the report format was to be by subsystems, card type 3 for subsystem report would be completed instead. The runstream to produce reports in batch mode is as follows:

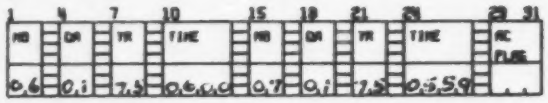
```
@RUN
@ADD REPGEN.
 (function code)
 (beginning/ending date time)
@FIN
```

The following examples demonstrate the use of program REPGEN in batch mode execution.

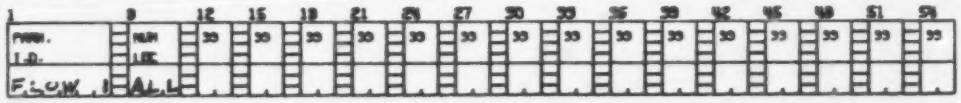
BLUE PLAINS PILOT TREATMENT PLANT
REPORT REQUEST FORM

CARD TYPE 1

CARD TYPE 2



CARD TYPE 3 - PARAMETER REPORTS



CARD TYPE 5 - SUBSYSTEM REPORTS

KEY

FC	- FUNCTION CODE
MO	- MONTH
DA	- DAY
YR	- YEAR
TIME	- 24 HOUR CLOCK TIME
AC FLAG	- YES: INCLUDE OUT OF RANGE DATA NO OR BLANK: DO NOT INCLUDE OUT OF RANGE DATA
PARM. I.D.	- PARAMETER I.D.
NUM LOC	- NUMBER OF SUBSYSTEM/SAMPLING STATIONS TO BE REPORTED OR 'ALL'
SS	- SUBSYSTEM/SAMPLING STATION CODE
S	- SUBSYSTEM CODE
NO ST	- NUMBER OF SAMPLING STATIONS TO BE REPORTED OR 'ALL'
ST	- SAMPLING STATION CODE

Figure V-10

Reproduced from best available copy.

```
>@SETC 1
>@XQT BLUEPROG.REPGEN
```

EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

DATA STORAGE AND RETRIEVAL SYSTEM

PROGRAM REPGEN

EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

REPORT PERIOD
7/ 1/75 0000 THRU 11/17/77 1625

OUT OF RANGE DATA INCLUDED

SUBSYSTEM H - LIME CLARIFICATION
SAMPLING STATION 0 - RAW WASTEWATER

	N	MINIMUM	MAXIMUM	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	SPREAD FACTOR
FLOW 1 GPM	1092	18.0000	38.0000	34.9835	.572609	34.9768	1.021
TEMP DEGREES C	92	22.0000	28.0000	25.8859	1.40271	25.8471	1.057

EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

REPORT PERIOD
7/ 1/75 0000 THRU 11/17/77 1625

OUT OF RANGE DATA INCLUDED

SUBSYSTEM H - LIME CLARIFICATION
SAMPLING STATION 1 - SCREENED RAW WASTEWATER

	N	MINIMUM	MAXIMUM	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	SPREAD FACTOR
PH UNITS	540	6.70000	7.60000	7.18555	.123934	7.18446	1.018
ALK MO PPM	545	70.0000	170.000	131.917	16.5208	130.782	1.145
TOC PPM	64	33.9000	100.300	62.5109	12.9056	61.1950	1.234
BOD PPM	63	56.0000	116.000	81.9778	12.7184	81.0090	1.169
COD PPM	64	123.000	290.000	204.078	36.8197	200.681	1.206
TPO4 PPM	63	5.10000	18.6000	13.4565	2.44450	13.2014	1.231
TKN PPM	60	8.40000	25.4000	16.9250	3.24626	16.6040	1.223
NH3 PPM	64	7.90000	22.2000	15.5500	2.94743	15.2689	1.216

NO2NO3 PPM	64	.000000	.600000	.843750-01	.820738-01	.193727	2.790
SS PPM	64	56.0000	136.000	100.187	19.6241	98.1702	1.231
VSS PPM	64	38.0000	106.000	72.4375	13.9362	71.0445	1.225
CA PPM	52	28.0000	44.0000	36.0577	3.77512	35.8616	1.112
FE PPM	52	.740000	2.57000	1.32135	.410972	1.26355	1.349
MG PPM	50	5.40000	9.20000	7.20200	.930769	7.14368	1.137
AG PPB	23	1.30000	7.30000	4.15087	1.61177	3.82183	1.547
AS PPB	24	.500000	4.50000	1.82083	.878229	1.63386	1.625
BA PPB	24	60.0000	269.000	166.208	58.4711	154.220	1.524
CD PPB	23	.350000	4.35000	1.83391	.981880	1.60628	1.726
CR PPB	24	6.00000	26.0000	14.7083	5.66821	13.6220	1.506
CU PPB	23	38.0000	105.000	57.8696	17.0622	55.7747	1.311
HG PPB	24	.350000	2.00000	.822917	.359426	.760308	1.492

MN PPB	24	90.0000	368.000	153.750	51.7605	147.904	1.307
PB PPB	24	7.60000	50.3000	17.2833	9.98201	15.2910	1.616
SE PPB	17	5.00000	5.00000	5.00000	.000000	5.00000	1.000
ZN PPB	24	67.0000	173.000	124.917	27.7816	121.585	1.280
F PPM	2	.430000	.760000	.595000	.233345	.571664	1.496
MBAS PPM	1	2.50000	2.50000	2.50000	.000000	2.50000	1.000
HRDNSS PPM	18	102.000	128.000	115.889	6.58778	115.709	1.059
CN PPB	1	7.00000	7.00000	7.00000	.000000	7.00000	1.000
PHENOL PPB	1	3.40000	3.40000	3.40000	.000000	3.40000	1.000

EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

REPORT PERIOD
7/ 1/75 0000 THRU 11/17/77 1625

OUT OF RANGE DATA INCLUDED

SUBSYSTEM H - LIME CLARIFICATION
SAMPLING STATION 2 - COLUMN AND FILTER BACKWASH RECYCLE

	N	MINIMUM	MAXIMUM	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	SPREAD FACTOR
FLOW 1 GPM	190	2.00000	5.50000	4.96579	.293381	4.95193	1.088
KW HRS KWH	92	5.80000	24.7000	13.0000	4.87571	12.0997	1.472

EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

REPORT PERIOD
7/ 1/75 0000 THRU 11/17/77 1625

OUT OF RANGE DATA INCLUDED

SUBSYSTEM H - LIME CLARIFICATION
SAMPLING STATION 5 - FLOCCULATION TANK

	N	MINIMUM	MAXIMUM	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	SPREAD FACTOR
PH UNITS	1084	7.90000	11.3000	9.96852	.276929	9.96450	1.029
SS PPM	64	1252.00	3124.00	2400.94	367.165	2370.18	1.182
TS PPM	62	1723.00	3461.00	2692.23	333.889	2670.59	1.139
LIME LBS	59	80.0000	160.000	103.051	36.5426	97.6848	1.372
FE ADD GAL	83	4.00000	10.5000	5.99398	1.52220	5.83530	1.251
FE CNC LBS/GAL	3	3.40000	3.40000	3.40000	.000000	3.40000	1.000
FE DLN GAL	84	44.0000	180.400	95.2286	18.2461	93.5172	1.215
FE FED ML/MIN	1091	.000000	720.000	225.927	57.0682	216.921	1.388

EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

REPORT PERIOD
7/ 1/75 0000 THRU 11/17/77 1625

OUT OF RANGE DATA INCLUDED

SUBSYSTEM H - LIME CLARIFICATION
SAMPLING STATION 7 - LIME CLARIFIED EFFLUENT

	N	MINIMUM	MAXIMUM	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	SPREAD FACTOR
ALK MO PPM	545	76.0000	194.000	135.046	20.1220	133.517	1.165
TOC PPM	63	9.00000	33.3000	19.1397	4.44590	18.6028	1.280
BOD PPM	62	14.5000	42.8000	25.7726	6.48239	24.9919	1.285
COD PPM	54	35.7000	108.000	58.0167	14.0354	56.4456	1.265
TPO4 PPM	64	.650000	2.90000	1.22312	.382195	1.17452	1.322
TKN PPM	61	5.00000	18.4000	11.5131	2.05990	11.3192	1.211
NH3 PPM	64	5.70000	15.1000	10.6125	2.00226	10.4175	1.219
NO2NO3 PPM	64	.000000	.600000	.151562	.109823	.152099	1.872

SS PPM	63	4.00000	37.0000	16.7302	8.03863	14.8265	1.674
VSS PPM	63	2.00000	21.0000	9.57143	4.32440	8.46872	1.711
CA PPM	51	43.0000	60.0000	50.2588	3.82211	50.1180	1.078
FE PPM	49	.150000	.830000	.309592	.143715	.284899	1.482
MG PPM	50	3.30000	6.90000	5.56600	.827984	5.49788	1.178
AG PPB	1	.140000	.140000	.140000	.000000	.140000	1.000
AS PPB	1	1.60000	1.60000	1.60000	.000000	1.60000	1.000
BA PPB	1	55.0000	55.0000	55.0000	.000000	55.0000	1.000
CD PPB	1	.550000-01	.550000-01	.550000-01	.000000	.550000-01	1.000
CR PPB	1	2.20000	2.20000	2.20000	.000000	2.20000	1.000
CU PPB	1	8.00000	8.00000	8.00000	.000000	8.00000	1.000
HG PPB	1	.800000	.800000	.800000	.000000	.800000	1.000
MN PPB	1	3.90000	3.90000	3.90000	.000000	3.90000	1.000

PB PPB	1	.290000	.290000	.290000	.000000	.290000	1.000
ZN PPB	1	8.00000	8.00000	8.00000	.000000	8.00000	1.000
F PPM	2	.410000	.660000	.535000	.176777	.520192	1.400
ALK P PPM	540	20.0000	120.000	63.7389	12.8710	62.3933	1.235

EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

REPORT PERIOD
7/ 1/75 0000 THRU 11/17/77 1625

OUT OF RANGE DATA INCLUDED

SUBSYSTEM - LIME CLARIFICATION
SAMPLING STATION 8 - LIME SLUDGE RECYCLE

	N	MINIMUM	MAXIMUM	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	SPREAD FACTOR
FLOW 1 GPM	489	5.25000	6.34000	5.25560	.652951-01	5.25522	1.012

EPA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

REPORT PERIOD
7/ 1/75 0000 THRU 11/17/77 1625

OUT OF RANGE DATA INCLUDED

SUBSYSTEM H - LIME CLARIFICATION
SAMPLING STATION 9 - LIME SLUDGE WASTED

	N	MINIMUM	MAXIMUM	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	SPREAD FACTOR
SS PPM	62	12560.0	31730.0	18122.4	2886.44	17918.9	1.161
TS PPM	57	12875.0	23782.0	17911.6	2058.76	17793.0	1.124
FLOW 2 GAL	540	.000000	501.000	205.970	44.0863	199.349	1.387
TVS PPM	59	2208.00	7316.00	4978.73	834.201	4903.13	1.201
DN TME HRS	16	.200000	7.30000	1.46875	1.71453	.958700	2.519

(Continues by Subsystem)

DEMAND PROCESSING

If reports are desired for only a specific parameter or subsystem, either with or without raw data listings, program REPGEN may be executed in demand mode. The user will be prompted for all necessary information. The following examples utilize the Master Directory for the current Blue Plains Plant and utilize the four options that may be used in demand processing.

```
@XQT REPGEN
ENTER FUNCTION CODE - TYPE "H" FOR HELP
>H
LISTING OF VALID FUNCTION CODES:

1 - SUMMARY REPORT BY SUBSYSTEM WITH DATA LISTINGS      BATCH MODE ONLY
2 - SUMMARY REPORT BY SUBSYSTEM WITHOUT DATA LISTINGS   BATCH MODE ONLY
3 - SUMMARY REPORT BY PARAMETER WITH DATA LISTINGS      BATCH MODE ONLY
4 - SUMMARY REPORT BY PARAMETER WITHOUT DATA LISTINGS   BATCH MODE ONLY
5 - SUBSYSTEM REPORT WITH DATA LISTINGS                 BATCH OR DEMAND MODE
6 - SUBSYSTEM REPORT WITHOUT DATA LISTINGS              BATCH OR DEMAND MODE
7 - PARAMETER REPORT WITH DATA LISTINGS                 BATCH OR DEMAND MODE
8 - PARAMETER REPORT WITHOUT DATA LISTINGS              BATCH OR DEMAND MODE
9 - END OF PROCESSING                                   BATCH OR DEMAND MODE
H - HELP  (PRINT THIS LISTING)                          DEMAND MODE ONLY

ENTER FUNCTION CODE - TYPE "H" FOR HELP
>8
ENTER BEGINNING AND ENDING DATE/TIMES OR "ALL"
AND WHETHER TO EXCLUDE OUT OF RANGE DATA AS FOLLOWS:
MM DD YY HHMM MM DD YY HHMM XXX   OR
ALL                         XXX
>ALL
ENTER PARAMETER I.D., NUMBER OF SAMPLING STATIONS (3 DIGITS)
AND SAMPLING STATIONS DESIRED OR "ALL" AS FOLLOWS:
XXXXXX XXX XX XX XX XX ...  OR
XXXXXX ALL
>DN THE ALL
```

EFA-DC PILOT PLANT WASTEWATER REUSE TREATMENT SYSTEM

REPORT PERIOD
4/ 1/75 0000 THRU 11/17/77 1508

OUT OF RANGE DATA INCLUDED

PARAMETER DN THE - UNITS HRS

	N	MINIMUM	MAXIMUM	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	SPREAD FACTOR
H9	4	.300000	1.30000	.775000	.457347	.664521	1.946
A9	6	.300000	2.80000	1.23333	.937372	.909768	2.510
I9	6	.300000	2.80000	1.31667	.856543	1.07134	2.130
J7	7	.300000	3.80000	1.67143	1.22163	1.28374	2.316

K7	6	.300000	23.2000	5.76667	8.71244	2.39858	4.452
L7	7	.300000	23.2000	5.05714	8.17187	2.05036	4.158

```
 SUCCESSFUL TERMINATION OF PREVIOUS FUNCTION
 ENTER FUNCTION CODE - TYPE "H" FOR HELP
>9

 PROGRAM EXECUTION IN DEMAND MODE TERMINATING  NORMALLY
>
```

F. PROGRAM PREPLT

The function of this program is to interactively prompt the user for parameter I.D., titles, symbol types, and various other information necessary to execute the plot program TYBLUE. Since the user must interact with this program to a large extent this program may only be executed in demand mode. However, if the user does not wish to remain connected to the demand terminal, he may specify that the plot program be submitted to the batch queue to await execution at a later time. Since this is an interactive program, the user is prompted for all information necessary for plot execution. Following is an example of a sample terminal session used to generate and submit a plot demand execution along with the computer listing of the points plotted and the resulting plot.

```
 @XQT PREPLT
 ENTERED PLOT PREPROCESSOR PROGRAM,
 PLOT RESTRICTIONS ARE AS FOLLOWS:
 1. FIVE (5) LINES PER PLOT
 2. TWO THOUSAND (2000) DATA POINTS PER LINE.

 ENTER THE NUMBER OF LINES TO BE PLOTTED ON THIS GRAPH.
>1
 DO YOU WISH TO USE THE EXTENDED GRID OPTION? (YES OR NO)
>NO
 ENTER FIRST  TITLE.
>GRAPHICS DEMONSTRATION
 ENTER SECOND TITLE.
>BLUE PLAINS DOCUMENTATION
 ENTER THIRD  TITLE.
>PARAMETER VS TIME
 ENTER Y-AXIS TITLE.
>PH
 IS THE Y-AXIS A LOG AXIS? (YES OR NO)
>NO
 DO YOU WISH THESE PLOTS TO BE EXECUTED IN DEMAND MODE? (YES OR NO)
>YES
 ENTER PARAMETER I.D. TO BE PLOTTED AND BEGINNING AND ENDING DATES AS FOLLOWS:
 XXXXXX MM DD YY HHMM MM DD YY HHMM
>     PH 04 01 75 0600 06 30 75 2359
 ENTER THE SUBSYSTEM/SAMPLING STATION TO BE PLOTTED
>L7
 ENTER ONE OF THE FOLLOWING LINE TYPES:
 LINEONLY, PTSONLY, LINE+PTS, PARABOLA, OR PARAB+PT
>LINE+PTS
 ENTER ONE OF THE FOLLOWING SYMBOL TYPES:
 SQUARES, CIRCLES, TRIANGLE, +, X, DIAMONDS, Z, Y, *, OR I
>+
 THE PLOT RUNSTREAM HAS BEEN EXECUTED - YOUR PLOT(S) ARE READY TO DRAW


 PROGRAM EXECUTION IN DEMAND MODE TERMINATING  NORMALLY

READY
READY
SYSTEM WARNING - MAX CARDS
SYSTEM WARNING - MAX CARDS
SYSTEM WARNING - MAX CARDS
SYSTEM WARNING - MAX CARDS
READY
READY
FURPUR 0026-11/17-15:13
*TIMEOUT WARNING*
```

```
$ASG,A PLOT181035.
READY


$ASG,A PLTC181035.
READY


$USE 4,,PLOT181035.
READY


$USE 8,,PLTC181035.
READY


$XQT BLUEPROG,TYBLUE
                EXPECTED          FOUND
                ********          *****

                NEXTPAGE          NEXTPAGE
                OPTION =          OPTION =                    ,00         ,00
                TITLE1 =          TITLE1 =    GRAPHICS DEMONSTRATION
                TITLE2 =          TITLE2 =    BLUE PLAINS DOCUMENTATION
                TITLE3 =          TITLE3 =    PARAMETER VS TIME
                TMIN   =          TMIN   =   4  1 75  600 3
                TMAX   =          TMAX   =   6 30 75 2359 0
                TLENGTH=          TLENGTH=       11,6480
                YLABEL =          YLABEL =  PH
                YMIN   =          YMIN   =        6,0000
                YMAX   =          YMAX   =        7,3000
                YLENGTH=          YLENGTH=        8,0000
                Y=LOG             Y=LINEAR
                NEXTLINE          NEXTLINE
                LINEONLY          LINE+PTS
                SQUARES           *

                                     1   5  7 75  710      7,10000
                                     2   5  7 75 1810      7,10000
                                     3   5  7 75 2310      7,35000
                                *
                                *
                                     4   5  8 75  710      7,40000
                                *
                                *
                                     5   5  8 75 2310      7,30000
                                     6   5  9 75  710      7,30000
                                     7   5  9 75 1810      7,40000
                                *
                                *
                                     8   5  9 75 2310      7,35000
                                *
                                *
                                     9   5 10 75  710      7,40000
                                *
                                *
                                    10   5 10 75 1810      110,000
                                *
                                *
                                    11   5 10 75 2310      110,000
                                *
                                *
                                    12   5 11 75  710      7,30000
                                *
                                *
                                    12   5 11 75  710      7,30000
                                *
                                *
                                    13   5 11 75 1810      7,40000
                                *
                                *
                                    14   5 11 75 2310      7,30000
                                    15   5 12 75  710      7,30000
                                    16   5 12 75 1810      7,15000
                                    17   5 12 75 2310      7,30000
                                    18   5 13 75  710      7,30000
                                *
```

19	8	13	78 1810	7,38000
20	8	13	78 2310	7,38000
21	8	14	78 710	7,18000
22	8	14	78 1810	7,30000
23	8	14	78 2310	7,200003
24	8	15	78 710	7,48000
25	8	15	78 1810	7,30000
26	8	15	78 2310	7,30000
27	8	16	78 710	7,40000
28	8	16	78 1810	7,30000
29	8	16	78 2310	7,30000
30	8	17	78 710	7,38000
31	8	17	78 1810	7,30000
32	8	17	78 2310	6,90000
33	8	18	78 710	7,38000
34	8	18	78 1810	7,30000
35	8	18	78 2310	7,30000
36	8	19	78 710	7,80000
37	8	19	78 1810	7,30000
38	8	19	78 2310	7,30000
39	8	20	78 710	7,30000
40	8	20	78 1810	7,20000
41	8	20	78 2310	7,20000
42	8	21	78 710	7,38000
43	8	21	78 1810	7,20000
44	8	21	78 2310	7,30000
45	8	22	78 710	7,18000
46	8	22	78 1810	7,30000
47	8	22	78 2310	7,20000
48	8	23	78 710	7,30000
49	8	23	78 1810	7,20000
50	8	23	78 2310	7,28000
51	8	24	78 710	7,10000
52	8	24	78 1810	7,18000
53	8	24	78 2310	7,20000
54	8	25	78 710	7,10000
55	8	25	78 1810	7,38000
56	8	25	78 2310	7,20000
57	8	26	78 710	7,18000
58	8	26	78 1810	7,38000
59	8	26	78 2310	7,38000
60	8	27	78 710	7,30000
61	8	27	78 1810	7,30000
62	8	27	78 2310	7,38000
63	8	28	78 710	7,20000
64	8	28	78 1810	7,30000
65	8	29	78 710	7,80000
66	8	29	78 1810	7,40000
67	8	29	78 2310	7,40000
68	8	30	78 710	7,30000
69	8	30	78 1810	7,30000
70	8	30	78 2310	7,80000

```
  71   5 31 75  710      7,63000
  72   5 31 75 1810      7,30000
  73   5 31 75 2310      7,20000
  74   5 30 75 2310      7,40000
  75   6  1 75  710      7,20000
  76   6  1 75 1810      7,30000
  77   6  1 75 2310      7,30000
  78   6  2 75  710      7,30000
  79   6  2 75 1810      7,30000
  80   6  2 75 2310      7,20000
  81   6  3 75  710      7,30000
  82   6  3 75 1810      7,30000
  83   6  3 75 3310      7,400003
  84   6  4 75  710      7,20000
  85   6  4 75 1810      7,40000
  86   6  4 75 2310      7,30000
  87   6  5 75  710      7,30000
  88   6  5 75 1810      7,40000
  89   6  5 75 2310      7,20000
  90   6  6 75  710      7,30000
  91   6  6 75 1810      7,20000
  92   6  6 75 2310      7,30000
  93   6  7 75  710      7,40000
  94   6  7 75 1810      7,40000
  95   6  7 75 2310      7,30000
  96   6  8 75  710      7,40000
  97   6  8 75 1810      7,20000
  98   6  8 75 2310      7,30000
  99   6  9 75  710      7,10000
 100   6  9 75 1810      7,20000
 101   6  9 75 2310      7,30000
 102   6 10 75  710      7,30000
 103   6 10 75 1810      7,40000
 104   6 10 75 2310      7,10000
 105   6 11 75  710      7,30000
 106   6 11 75 1810      7,30000
 107   6 11 75 2310      7,30000
 108   6 12 75  710      7,30000
 109   6 12 75 1910      7,00000
 110   6 12 75 2310      7,20000
 111   6 13 75  710      7,50000
 113   6 13 75 1810      7,10000
 113   6 13 75 2310      7,20000
 114   6 14 75  710      7,40000
 115   6 14 75 1810      7,30000
 116   6 14 75 2310      7,30000
 117   6 15 75  710      7,40000
 118   6 15 75 1810      7,30000
 119   6 15 75 2310      7,20000
 120   6 16 75  710      7,50000
 121   6 16 75 1810      7,50000
```

```
  122   6 16 75 2310       7,80000
.
.
  123   6 17 75  710       6,90000
  124   6 17 75 1810       7,30000
  125   6 17 75 2310       7,20000
  126   6 18 75  710       7,80000
.
.
  127   6 18 75 1810       7,20000
  128   6 18 75 2310       7,30000
  129   6 19 75  710       7,30000
  130   6 19 75 1810       7,30000
  131   6 19 75 2310       7,30000
  132   6 20 75  710       7,30000
  133   6 20 75 1810       7,40000
.
.
  134   6 20 75 2310       7,30000
  135   6 21 75  710       7,40000
.
.
  136   6 21 75 1810       7,30000
  137   6 21 75 2310       7,40000
.
.
  138   6 22 75  710       6,90000
  139   6 22 75 1810       6,90000
  140   6 22 75 2310       7,40000
.
.
  141   6 23 75  710       7,20000
  142   6 23 75 1810       7,20000
  143   6 23 75 2310       7,20000
  144   6 24 75  710       6,80000
  145   6 24 75 1810       7,10000
  146   6 24 75 2310       7,40000
.
.
  147   6 25 75  710       7,30000
  148   6 25 75 1810       7,20000
  149   6 25 75 2310       7,30000
  150   6 26 75  710       7,40000
.
.
  151   6 26 75 1810       7,30000
  152   6 26 75 2310       7,20000
  153   6 27 75  710       7,30000
  154   6 27 75 1810       7,10000
  155   6 27 75 2310       7,40000
.
.
  156   6 28 75  710       7,30000
  157   6 28 75 1810       7,30000
  158   6 28 75 2310       7,80000
.
.
  159   6 29 75  710       7,20000
  160   6 30 75 1810       6,80000
  161   6 30 75 2310       7,30000
  162   0  0  0    0       ,100000+31
.
```

NEXTLINE FINISHED

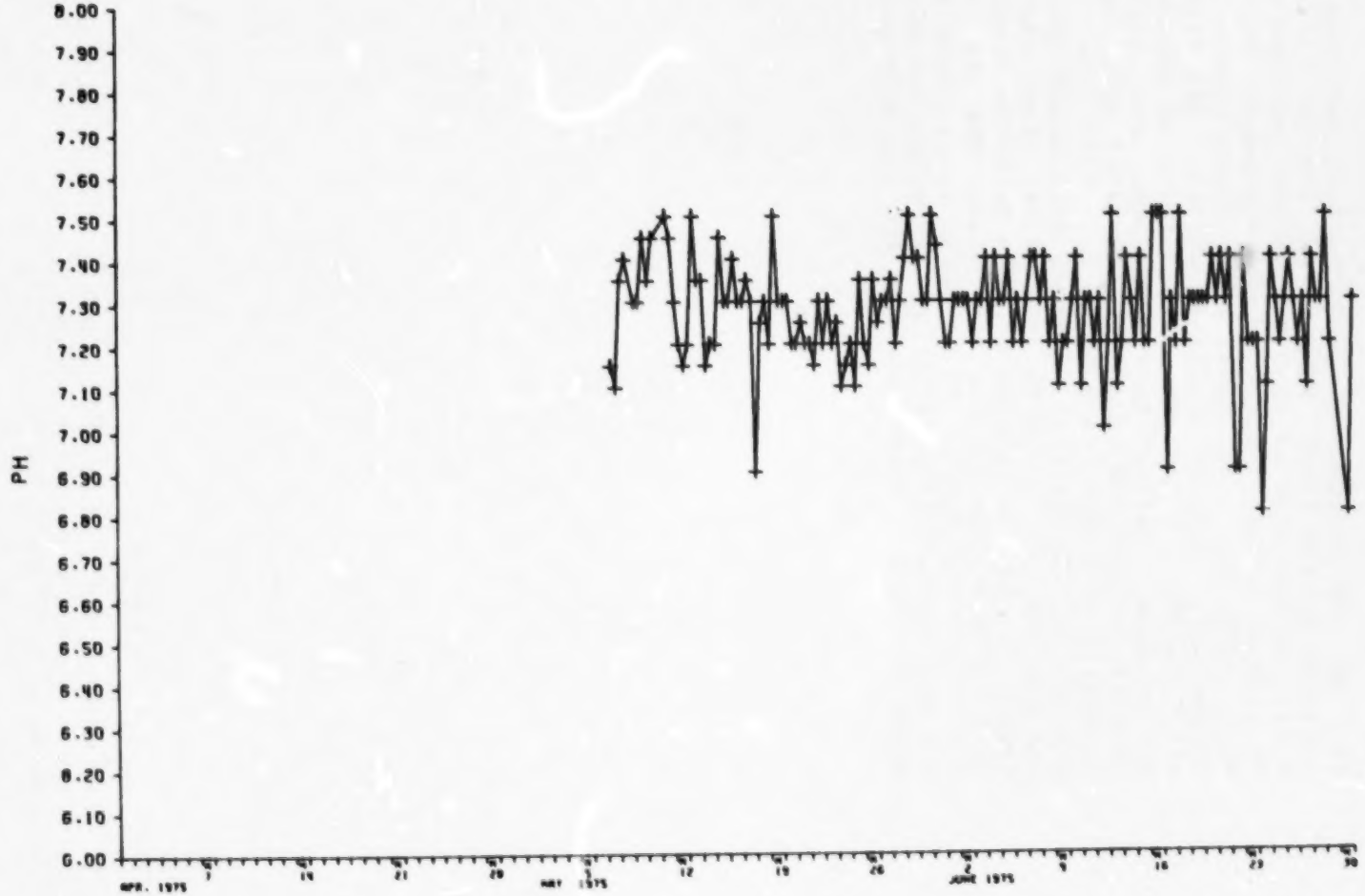
FINISHED

PROGRAM EXECUTION HAS TERMINATED

SBRKPT PUNCH6

SBRKPT PRINT6

GRAPHICS DEMONSTRATION
BLUE PLAINS DOCUMENTATION
PARAMETER VS TIME



G. ERROR MESSAGES

All of the preceding programs have numerous error checks included in the code. When these checks discover errors, either in the data or in the commands, various messages will be printed to let the user know erroneous information has been detected. In batch mode, these checks fall intc two categories, warnings and fatal errors. The warning message will inform the user an invalid piece of data was detected, for example - invalid time specified, but will allow the program to continue execution. A fatal error will terminate execution of a program abnormally. This type of error is caused by an invalid piece of data which is essential for the program to continue execution, for example - a 0 specified for the number of data units in program DATASTORE will cause a fatal error. In demand mode the error checks are only warnings. If an error is detected in batch mode the user is notified of an invalid entry and prompted tc re-enter the data. These messages are all self-explanatory.